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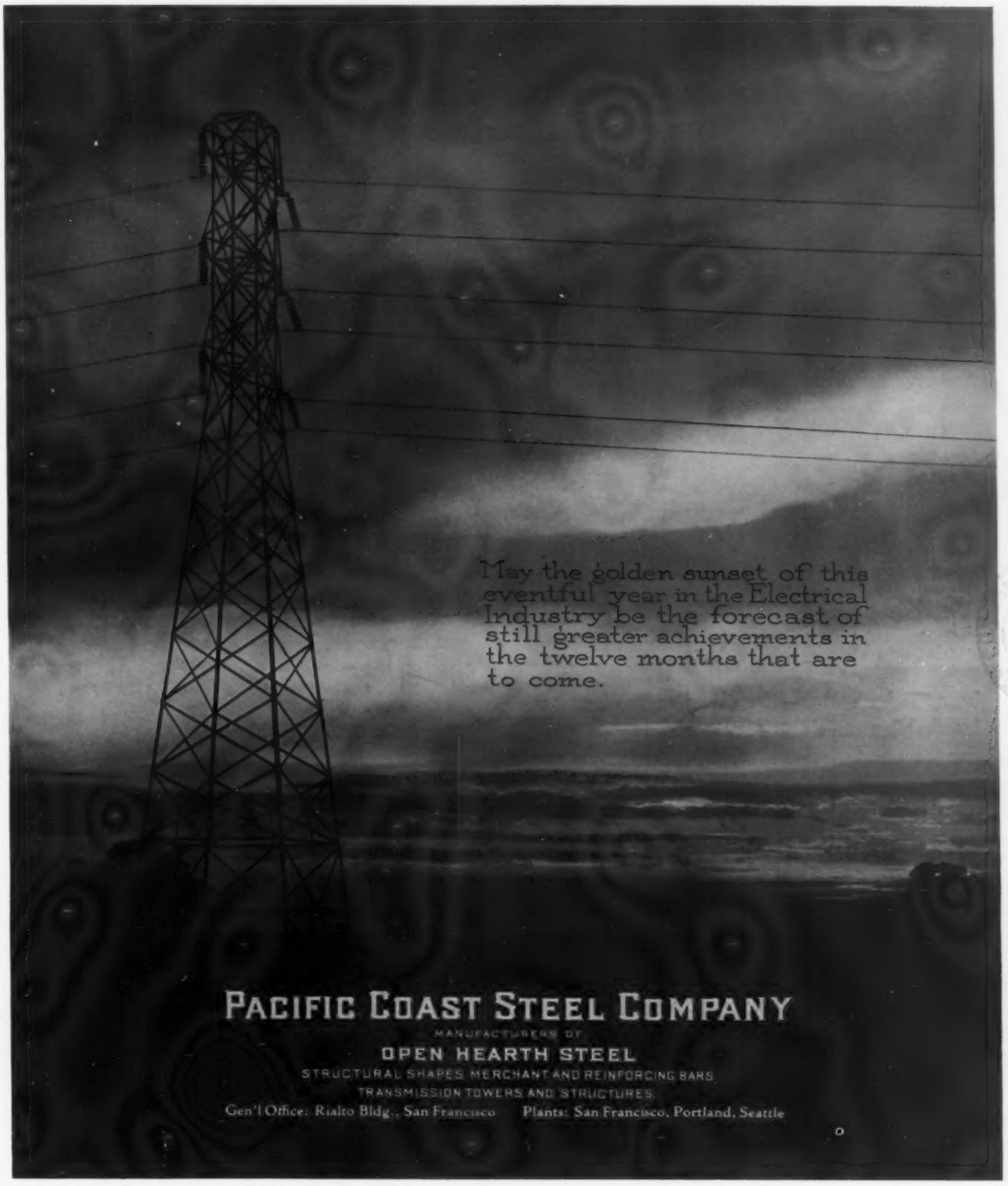
Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES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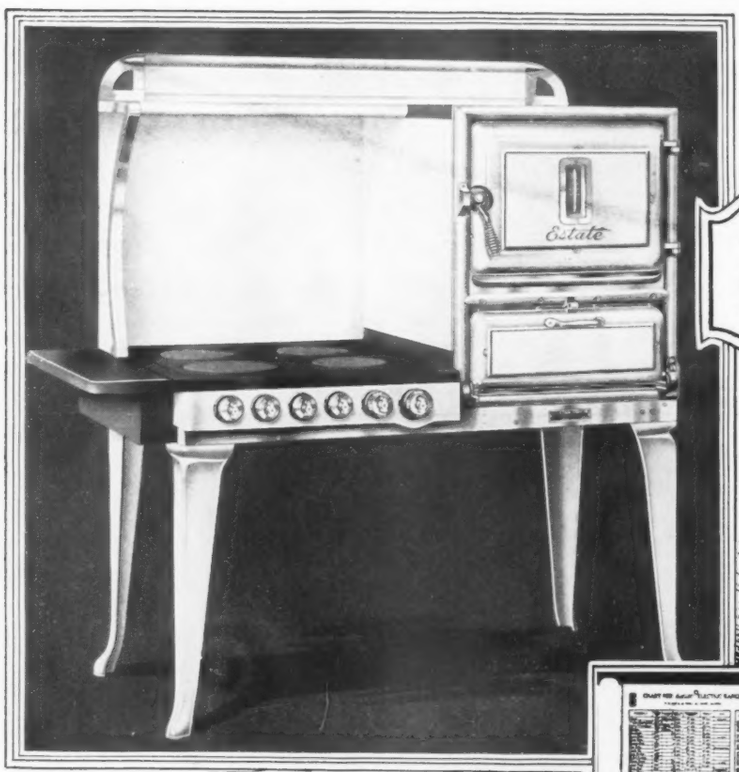

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IN THE ELEVEN WESTERN STATES

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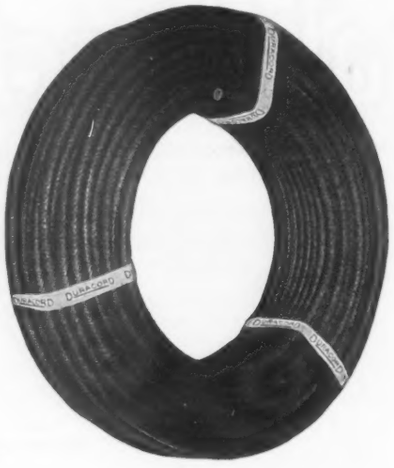
Radio Retailing

THE McGraw-Hill Company, Inc., desires to announce a new publication, Radio Retailing, to make its first appearance on Jan. 1, 1925. Radio Retailing will be published in the same size as Electrical Retailing, and will be distributed as a supplement to that paper and Electrical Merchandising and thus have a circulation within the electrical trade of 45,000 copies monthly.

There has been a genuine and increasing need for a radio publication to serve the whole field of the radio trade, so much so that the McGraw-Hill Company, Inc., has been solicited time and again to employ its publishing organization in bringing out such a paper.

Since the McGraw-Hill electrical publications have been serving the radio industry since before 1920, the field is not new to the editors who have undertaken this responsibility. The editorial section, under the direction of O. H. Caldwell, and the business section, directed by H. A. Lewis, will reflect the experience gained by years of association with the merchandising problems of radio, and constitute a medium of expression that will render real service within the radio trade.

The editors of the Journal of Electricity take pleasure in introducing its new confrere to the electrical industry of the West.



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Cost of Distribution of Electrical Merchandise

IN the opinion of General Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company, the cost of distributing goods is too high. Speaking before the recent meeting of the Electrical Supply Jobbers' Association at Cleveland on the subject of "The Future of Electrical Merchandising," General Tripp said:

"The question of the cost of distribution is a problem of national importance, and it lies at the bottom of much of the current unrest and criticism of our present economic system.

"When the farmer discovers that milk for which he received 3 cents is being retailed at 16 cents, he feels cheated. When the consumer learns that the first cost of the milk for which he paid 16 cents was only 3 cents, he feels cheated. When the working man finds that the article for which he was paid 50 cents to make retails at $6, he, too, feels cheated. The upshot is that all hands go hunting for the man who got the money.

"Save in a few exceptional cases, no guilty party has been discovered. Everyone engaged in conveying goods from the producer to the ultimate consumer has been able to show that he is engaged in an essential service, and no one has been found sequestering an undue share of the proceeds; but the public is still unconvinced, and this is why the high cost of distribution still remains a problem."

General Tripp was not speaking particularly of the electrical industry. As a matter of fact, he went on to point out that the selling cost of electrical merchandise was less than for many other lines including phonographs, furniture and perishable farm produce. He stated, however, that the electrical industry was under a moral obligation to reduce its cost to the lowest possible value.

We will go one step farther than General Tripp and say that the cost of electrical merchandise, particularly the labor-saving domestic appliances, to the consumer is too high. Although the volume of sales of appliances has been increasing from year to year, the total sales have been hardly sufficient to keep up with the growth in residential consumers. The industry has not only failed to hold its own, but has actually lost ground.

The high cost of appliances may be due in part to the cost of distribution. But, like the author of "Sweeney and the Saxophone" on another page of this issue, we are inclined to believe that it is due to the failure to create a demand sufficient to bring about quantity production and its corollary, a lower unit cost. Like one of our contemporaries, we feel that when the electrical industry has produced a Henry Ford in the appliance field, the public will find no reason to criticise the high cost of distribution of electrical merchandise.

The "Red Seal" Standard for Adequately Wired Homes

FOR years there has been a persistent demand for a satisfactory method of bringing about a proper understanding by the public of the necessity for installing adequate wiring to provide for convenient electrical service. A standard of safety has been established by the National Electrical Code, but no authoritative standard for convenience has been offered as a guide to the public.

Insufficient wiring has been a big obstacle in the increased sale of portable lamps and fixtures, dining room, kitchen and laundry equipment, air and water heaters, ranges, and all the great variety of electrical labor savers and conveniences which have come on the market during recent years. The installation of wiring has not kept pace with the growth of electrical appliances and devices for the home. The supposed difficulty of installing extra wiring after the building is completed has continually retarded the impulse to buy and use the new appliances.

Few people, with the problem of building a new home or remodeling an old one, know how to specify all of the details of wiring to give them the kind of electrical service they will want later. The various cooperative organizations within the industry have done valuable educational work in overcoming this difficulty. Yet the public needs a simple and effective means for summing up these technical details in a symbol that everybody can understand.

The Society for Electrical Development is sponsoring for the United States the "Red Seal" plan, which was devised in Canada. Briefly, the plan establishes a standard for home wiring. A "Red Seal" home is an adequately wired home. Differences in local conditions will make it necessary to adjust the specifications to suit local requirements, but this difficulty can be easily overcome. It should be understood that the standard, while higher than the average, may not represent the ideal. It is neither the maximum nor the minimum, but is a practical standard which will permit the user to obtain adequate electrical service with an outlay for wiring which bears the proper relation to the total cost of the home.

The plan is basically sound. It is easily adaptable to local conditions. It fills a long-felt want. It should prove a splendid follow-up for the educational work in better wiring done by cooperative organizations during the past few years. For those reasons we recommend it to the serious consideration of the electrical industry here in the West.

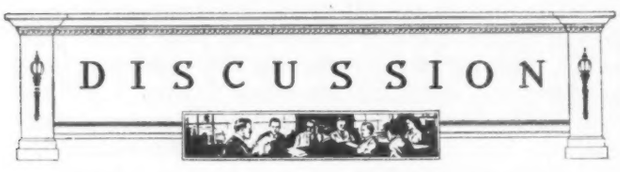
Doctor Says Man Run by "Dry" Cells

MAN has been likened to many things—at times. Darwin said that he was once a monkey. Some of us still are. Dr. Woods Hutchinson likened a man to an internal combustion engine, within whose mechanism the sugar taken into the system became, by chemical processes, alcohol. Thus is the internal engine fuelized, except when the man, in his ignorance, attempts to maintain his distillery in Scotland, rather than in his abdomen.

Now comes science again to the fore. Another doctor, this time a surgeon, Dr. George W. Crile of Cleveland, smashes the quite appealing distillery idea advanced by Dr. Hutchinson and offers a substitute—a quite unsatisfactory one—the idea that man is operated electro-chemically and that he, marvelous to relate, is made up of some 28,000,000,000,000 "electric" cells—dry batteries perhaps, since the passage of the Volstead act.

The human emotions—love, hate, fear and the others—according to the learned doctor, are merely stimuli, liberating currents of electrical energy to roam around within us in certain defined paths. Each of the twenty-eight odds and ends of trillions of cells—dry batteries—no, "wet" batteries, says the doctor, have positive and negative poles, without which we will agree no battery, wet or dry, is complete. Of these, the brain cells, it seems, are the most positive, while those of the liver are the most negative.

Here, then, is what has been the matter with our liver all this time. Avaunt, calomel and nasty-tasting nostrums. Let us short our recalcitrant livers, or ground them, or insulate them against the high-voltage indigestion germs found in rich food. Here is an opportunity for a real combination, by which these electrical emanations may be harnessed, synchronized and a new type of central station developed, and the ultimate consumer protected from the vagaries of rainfall and the price of oil.



The Walla Walla Mill Creek Plant That Was Built in 1892

To the Editor:

Sir: In the Nov. 1, 1924, issue of the Journal of Electricity I read an article sent in by Cooper Anderson of the Utah Power & Light Company, which was very interesting. Acting upon your request to the readers of the Journal for further data on early hydroelectric installations, I am sending you the history of the old Mill Creek plant of the Walla Walla Gas & Electric Company.

The plant was built in 1892 and was put in operation in 1893. The pipe line carrying water to the plant was constructed of redwood in barrel form, banded with steel rods, the ends being connected by a special cast iron shoe. This pipe had an inside diameter of 48 in. and was 5,200 ft. in length. As the pipe line passed through farm lands, it was laid in a trench and back-filled so that farming operations could be carried on over the pipe. At intervals along the pipe there were vacuum breaking valves to prevent the pipe's collapsing in case the water was let out when the headgate was closed. The intake was a concrete chamber which maintained the water level about 8 in. above the center of the pipe.

The water was diverted from the stream into the intake by a low piling and planked dam. The pipe was laid on a regular grade its full length and had a very slight lateral curvature, obtaining a head of 80 ft. in the 5,200 ft. of pipe.

The power house building was 40x40 ft., with brick walls. All piers and foundations for machinery were of brick laid in Portland cement, with the exception of the foundation for the generator, which was of concrete capped with 8 in. of redwood.

There were two 18-in. Pelton water wheels, each supplied by two 6-in. streams of water, both streams being applied on the lower part of the wheel. There also were installed two Doolittle governors, which were of the differential type, using a small Pelton wheel to supply the standard speed. These governors controlled the amount of water admitted to the wheel, through rods and levers connecting to butterfly valves in nozzles back of the tips.

Like many early attempts at governing water wheels, these governors were not practical for their purpose, so after much adjustment and experimentation and bursting of the pipe line they were abandoned. The butterfly valves were thrown out also, and in place of them the Pelton people sent ball joint tips with the hood cut off and ground to a suitable radius. The needle valves were not used much, if at all, at that time.

Mounted on each water wheel shaft was a 10-ft. wooden rimmed 7-grooved drive wheel grooved for 1-in. transmission rope. The counter shaft sheave was of 54-in. diameter and had 11 grooves. To take up the extra turns a 4-groove idler was used. Each drive required about 700 ft. of rope, the rope being endless. The cross was taken out overhead by a stationary pulley and a pivoted pulley mounted on a track with a cable and weight for take-up. Mounted on the counter shaft was an 8-in. band wheel with an 18-in. face which was used to drive the generators through a belt.

The original plan was to drive a separate generator with each wheel without any mechanical connection, but after starting operation it was found that one wheel could not supply power enough to carry the capacity of one generator, so the two coun-

ter shafts were connected with a simple clutch, and the second generator was never installed. The generator was a Thompson-Houston Company 100-kw., single-phase, a.c. machine, with revolving armature. It was rated 1,100 r.p.m., 1,100 volts, 120 cycle, single phase. This generator had a commutator as well as collector rings, the commutator being used to rectify a portion of the current for compensating purposes in field regulation.

The exciter, which was belt driven from the generator, was a Thompson-Houston Company 500-volt, compound wound, d.c. bipolar machine, with a capacity of about 30 amp. The high voltage and large capacity of this exciter were needed, as the original Mill Creek plant was to supply power to drive the old machinery in the city plant, which was at the time driven by steam.

In 1892, when the hydroelectric plant was installed, the city plant consisted of two 54x16-in. return flue boilers and a 100-hp. Erie-Ball tandem compound 300-r.p.m. engine. This engine drove the lighting machinery, which consisted of two Edison 3-wire system incandescent light generators and two small arc light machines, one a Wood and the other an Edison. These machines supplied the distributing system of the city.

In order to utilize the Mill Creek hydroelectric power a 100-kw., single phase a.c. synchronous motor was installed in the city plant five miles from the hydro station. This motor was designed to drive the counter shaft through a belt and friction clutch. The arrangement was such that both motor and engine could work together on this shaft or either could be operated independent of the other.

The reason for the high voltage and oversize of the Mill Creek exciter lay in the manner in which the power was used. Since it was impossible to start a single phase synchronous motor from a state of rest, or in fact below synchronism, there had to be some means of bringing this motor up to proper speed. To do this the switchboards at each end of the line were equipped with double-pole, double-throw main switches. The No. 0 copper transmission line was connected at each end to the middle point of this switch, and the generator at the Mill Creek plant and the synchronous motor in the city were connected to the top points of the switches. The 500-volt, d.c. exciter at Mill Creek and the 500-volt, d.c. motor in the city plant were connected to the bottom points of the switch.

By throwing the switch at the power plant to the lower position, 500 volts d.c. were sent on to the line. By throwing the city switch to the lower position, a 500-volt, d.c. motor was connected to the line. This motor through a belt brought the synchronous motor up to synchronous speed.

When the operator in the city had the proper speed he would open the switch and the operator at Mill Creek, by watching the indicator, would determine the proper time to throw his switch to the upper point, thus connecting the a.c. generator to the line. The closing of this switch lighted a pilot lamp in the city, indicating to the city plant operator the time to throw his switch to the upper point, thus connecting the synchronous motor and the a.c. generator. This procedure of getting the synchronous motor up to speed and on the line was successful most of the time, but often involved many trials.

The switchboard at the hydro plant had a wooden frame with square posts at each end and in the center. Cross bars were set flush into the posts and were spaced several inches apart, according to the dimensions of the slate base with which all instruments were supplied. All of the switchboard equipment was furnished by the Thompson-Houston Company, and consisted of two lightning arresters, two voltmeters, two ammeters, an exciter rheostat, one single-throw double-pole switch, one double-throw double-pole switch. All of the switches were of the air break type. The telephone was mounted on one end of the switchboard.

This plant was used until 1900 and was very inefficient, obtaining an efficiency of about 50 per cent. The transmission line consisted of two No. 0 hard-drawn bare copper wires carried on glass insulators. The poles were of peeled fir, fifty-two poles being used per mile. The length of the transmission line was five miles.

A great deal of trouble was experienced with lightning burning out the generator coils, and many devices were employed to seek protection. Various kinds of patented arresters were used, and at one time barbed wire was placed on top of the poles for the full length of the line, this wire being grounded at frequent intervals. This grounded barbed wire proved no better than the other protection devices, and the generator coils continued to burn out. Finally the company adopted the policy of shutting down the plant when any sign of lightning was present.

In 1900 all of the old machinery was discarded and a 300-kw. direct connected 6,600-volt, 16-cycle, monocyclic generator was installed, together with a 500-hp. McCormick hydraulic turbine. The tail race was deepened, and by the installation of a draft tube the effective head was increased from 80 ft. to 93 ft. A steel standpipe was installed to prevent water hammer. This installation did away with all the old machinery in the city steam plant, that plant being used as a substation for distribution purposes only.

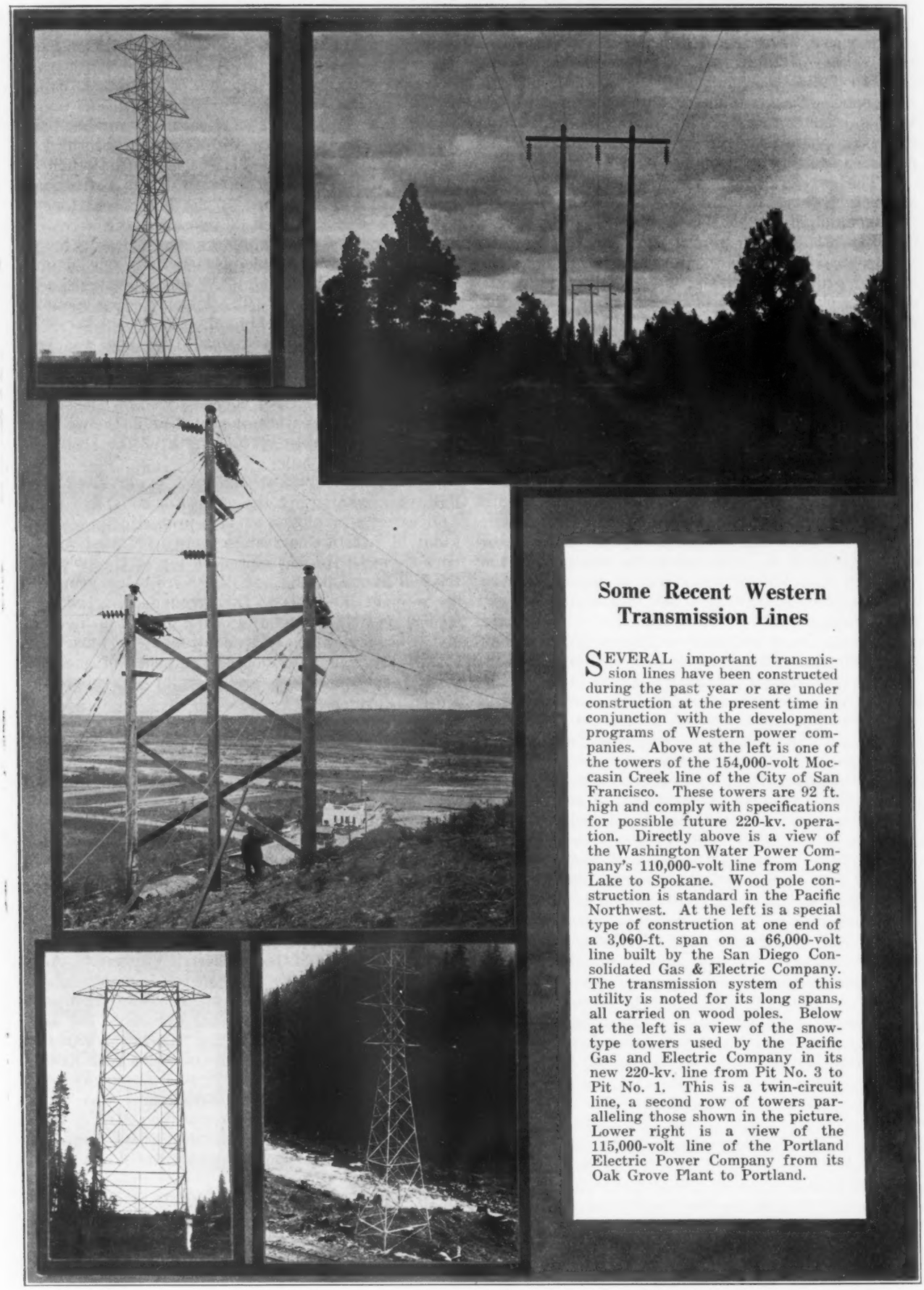
The corporate name of the company at that time was the Walla Walla Gas & Electric Company. A. J. Burrows was secretary and general manager. P. B. Young was superintendent of the power plant, and it was through his courtesy that I obtained the data on this installation. Mr. Young assisted in erecting both the city steam plant and the Mill Creek hydroelectric plant.

The Mill Creek hydroelectric plant was abandoned in 1905, when the Northwestern Gas & Electric Company put a new plant of 1,500-kw. capacity in operation on the South Fork of the Walla Walla River.

G. H. ROBINSON,

Operator Walla Walla River Plant, Pacific Power & Light Company.

Milton, Ore., Dec. 1, 1924.



Some Recent Western Transmission Lines

SEVERAL important transmission lines have been constructed during the past year or are under construction at the present time in conjunction with the development programs of Western power companies. Above at the left is one of the towers of the 154,000-volt Moccasin Creek line of the City of San Francisco. These towers are 92 ft. high and comply with specifications for possible future 220-kv. operation. Directly above is a view of the Washington Water Power Company's 110,000-volt line from Long Lake to Spokane. Wood pole construction is standard in the Pacific Northwest. At the left is a special type of construction at one end of a 3,060-ft. span on a 66,000-volt line built by the San Diego Consolidated Gas & Electric Company. The transmission system of this utility is noted for its long spans, all carried on wood poles. Below at the left is a view of the snow-type towers used by the Pacific Gas and Electric Company in its new 220-kv. line from Pit No. 3 to Pit No. 1. This is a twin-circuit line, a second row of towers paralleling those shown in the picture. Lower right is a view of the 115,000-volt line of the Portland Electric Power Company from its Oak Grove Plant to Portland.

Sweeney and the Saxophone

By Richard E. Smith

Advertising Manager, Southern California Edison Company, Los Angeles, Calif.

WHO are the prospective buyers of labor-saving domestic electric appliances? In this article the author has classed them under one head, namely Sweeney. He then analyzes Mr. Sweeney, his income, his family, his mental processes and his hobbies. He finds that Mr. Sweeney has a balance of $15 after all items of the monthly budget are met. The saxophone in the story is the competitor of the appliances. It includes "balloon tires, phonographs" and the like.

AN advertising man in New York who has the responsibility of getting more business for the magazine he serves, in soliciting orders from those who place advertising, has been using the catch line, "Tell it to Sweeney."

In his arguments he explains that while the millionaire is greatly to be desired as a customer few concerns can prosper by catering to him alone. It is the great prosperous middle class, the Sweeneys if you please, that constitutes the American market. Above Sweeney in the social scale is a limited number of people who can buy practically anything they want. They are fastidious, finicky and on the whole rather hard to sell. Below Sweeney is a big group of those who live on a hand-to-mouth plan. They can afford no luxuries and frequently not even all the necessities. In buying they are controlled by price more than anything else and have little opportunity to pick and choose. In between these two groups we find the Sweeneys, whose trade is decidedly worth while.

For some time I have been speculating about the electrical business, and I wish to explain that any remarks made in this paper are strictly on my own responsibility. They are my own thoughts and do not in any way bear the authority of the company which employs me.

From my observation it seems to me that the American people are not buying as much electrical merchandise as they should. When we consider that every electrical device has a distinct economic value; that it saves time, labor or money, and generally saves all three of these, then we wonder how people can pass our stores and spend their money for non-essentials. It occurs to me that possibly we have not made the proper analysis of our market. It may be that we have been working our statistics from the wrong end. By this I mean that we read bank clearings, building permits, postal reports, income tax statements and similar items which have a bulk value, but are decidedly lacking in detail. So I am going to ask your attention while we make a detailed analysis of Sweeney, a typical American citizen.

I am going to start with the assumption that Sweeney is an educated, businesslike, thrifty and industrious citizen. He lives in the better part of town, either rents or is buying his home, is providing well for his family, associates with good people, is giving a proper education to his children, owns a middle grade car, carries adequate insurance and is laying money aside for a rainy day. He is the kind of man you would like to have for a customer.

I am now going to assume that Sweeney has an income of $250 a month. This would identify him as a man better than the average in most lines of endeavor. He may be a high school teacher or the principal of a grammar school; a young professional man getting a good foothold; the chief accountant in some important establishment; the editor of a suburban newspaper of more than ordinary prestige. If he is in the public service, he may be chief of police or chief of the fire department or he may hold any city or county office just below the top positions. If he is a minister, his congregation is above the average. He is liberally represented in the building trades. If he is a farmer and regularly nets $3,000 a year, he is to be congratulated.

You will see from this list that Sweeney is of considerably higher type than you thought at the outset. Such workers as mail carriers, motormen, conductors, most mechanics, clerks, bookkeepers and small merchants are entirely eliminated.

When you meet Mr. Sweeney, you size him up instantly as a good customer, as one who will readily purchase almost anything that you have to offer. If we should start an extensive range campaign tomorrow, Mrs. Sweeney would be the first lady to receive the attention of our salesman.

Many thrifty families now keep a budget in which they allocate as nearly as possible the amount of money they will allow each month for different purposes. Here is a budget which I have made for Mr. and Mrs. Sweeney. I think it is fairly accurate and that the amounts allowed are conservative. The first item of the monthly charges is rent, for which I allow $50. If he is buying his home, this amount or a little more will take care of the monthly payments. For the regular household expenses, including groceries, vegetables, meat, milk, gas, electricity, water and telephone, I allow $60. The next largest single item is the automobile. Sweeney owns a good car, probably a Studebaker, Buick, Essex, Maxwell or Dodge, but it is not paid for. He is making monthly payments between $30 and $50, so we will

allow $40. Next come clothing, including suits, shows and things for the children, average $20. Sweeney carries life insurance costing $10 a month. He has some systematic method of saving, in which he places $15 a month. For the doctor, dentist and barber I have allowed $5. For car fare, lunches, tobacco, $15. For amusements, including the annual vacation, $10. For church, lodge, music lessons, papers and magazines, $10. You will admit that each of these items is reasonable for a man in Sweeney's circumstances, and unless you have made a mental addition you are of the impression that there is still a tidy balance left out of his monthly pay check of $250. As a matter of fact, these items total $235, and the balance left for all other purposes is only $15.

"Balance $15"

A lecturer in mathematics, working out a complicated problem, from time to time sets to one side certain significant equations. That is what I want you to do at this point. Over on one side of your mental blackboard set out this item, "Balance, $15."

By this time you can see that our analysis is going to lead to some interesting developments. In fact, I think this statement, "Balance, $15," is the answer to a lot of things that have been puzzling our industry. As we ride around California and see so many evidences of prosperity, we jump to the conclusion that almost anything of merit will find a ready sale. Mr. Sweeney, it seems, is the man we encounter most frequently on these journeys. He is sticking rather close to his alley and is not spending any money without careful thought. He is living pretty well, to be sure, but he is not going to be reckless about anything.

Right here is where the saxophone comes into my story. I use this to typify the numerous things that Sweeney buys which he really does not need, and I declare that the saxophone and what it represents furnishes extremely keen competition to the electrical industry. To show what I mean, let us take a look at the Sweeneys on Sunday morning. Yesterday was pay day. Last night the family went to the movies and purchased two or three little luxuries for Sunday. This morning they slept late, had a good breakfast and now are going through the Sunday paper. The pay check has already received a few dents, but it is in pretty good shape and everybody is happy. Of course, the regular items of the budget must be met, but there is a general assumption that this month they will have a little more for extras than was the case last month.

Psychoanalyzing Sweeney

So here is Mrs. Sweeney going through that part of the paper which interests her most. It contains some society news, gossip of the movies, the book page, comment on artists and musicians and—the department store ads. Mr. Sweeney, without second thought, has picked up the section devoted to the great outdoors, sports and automobiles. They are reading promiscuously, so they think, but what are the impressions that are registered on their subconscious minds?

If we could take Mrs. Sweeney's subconscious mind into a dark room and develop it as we would a film, we would find something like this (and bear in mind the significant statement, "Balance, $15"): Porch swings, wrought iron frame, finished in fancy denim with top and fringe, regular price $40, Monday only $32.50; bedding special, full width white woolen blankets, regular $9, clearance sale price $7.59; boys' school suits with two pairs of pants, sizes 9 to 14, special Monday only $13.50; 1,000 yards Canton crepe, all colors, 40 inches wide, regular $3 a yard, Monday only $2.49; three-piece living room overstuffed suite, velour or tapestry, regular $200, during this sale $169.50; and so it goes through Mrs. Sweeney's list.

Doing the same thing with Mr. Sweeney's subconscious mind, we find impressions of balloon tires, a camping outfit, a new suit, a rifle, a set of golf clubs and several others things that he wants to get just as soon as they have a little more money. What are you thinking right now? Don't you see that your mind and Sweeney's are miles apart and that not only will they not come together, but they threaten to get still further apart? You are competing with the saxophone, and I think you will admit that so far the saxophone gets the decision.

Sweeney's Financial Leave of Absence

Return again to our $15. Has it occurred to you that the saxophone costs about $150? So does a phonograph, a good rug, a set of new tires, a vacation and several other articles I might mention. It is surprising how many good things there are in the world that can be obtained for about $150. Among them are the electric range and the washing machine. But Sweeney has only $15 a month for such purposes.

Now I come to the second fact that I want you to set to one side. When Mr. Sweeney obligates himself for a saxophone or anything else that costs $150, he is definitely out of your market for ten months. In other words, if he buys a saxophone today, he is not a prospect for an electric range or a washing machine until next October. You can argue and demonstrate and solicit and cooperate in the most approved style. It won't do any good because Sweeney is not there. He is on a financial leave of absence. Also bear in mind that between now and next October several other opportunities will be knocking at his door awaiting a chance to get in.

Now we come to another condition which threatens to upset even the limited amount that we had hoped would percolate into our electrical cash drawers. The new trouble-maker is hobbies. Both Mr. and Mrs. Sweeney, being free born, intelligent, aggressive and pleasure-loving, have some sort of hobby. To this hobby they will allow a greater portion of the budget than it really deserves. You may think that Sweeney cannot afford to play golf, but a great many of him do that very thing. If he does play golf, he is going to justify his action with his own conscience and juggle with the budget in some way. If it is not golf, it is some other hobby—fishing, books, stamps, hiking, photography or some-

thing else that is constantly calling for money. Mrs. Sweeney is probably more modest in spending money for hobbies, but you may be sure she has some weakness.

I think this is enough of an analysis to show that the man whom we first carelessly identified as our best customer has to be herded in fairly large quantities before he spells any great era of prosperity for the electrical industry. At this point someone may ask, "If all this is true, how has the electrical industry managed to survive so far?" The answer is that Sweeney has purchased to a limited degree in spite of our salesmanship and not because of it. He buys wiring and fixtures for his house and is including payment for them in his appropriation of $50 a month. Mrs. Sweeney by skimping and saving has managed to get a washing machine. She has an iron and toaster, but they were probably Christmas presents. You may think she needs a waffle iron, but that would cost about $15, and you know now what she is going to think before she spends that amount of money in a lump.

All of us study charts and curves. Every sales manager wants to see this year's business better than last year's business. We talk about saturation, distribution, diversity and other abstract things. Why not talk about something concrete like Sweeney's $15 a month? All of us depend upon the prosperity of the electrical business for our bread and butter. We are all looking for an increased volume of business. In California this increase has been provided regularly by an increase in population, and it is to be hoped that this condition will prevail for many years. We should take the regular staple business, such as wiring and fixtures, electric irons, flash lights and batteries, more or less for granted. We will get so much business of this sort, anyhow. What we are after is new business—something in addition to the regular trade—and this must come largely from Sweeney.

Sweeney and Radio

Someone may ask quite pertinently if all the money in the world is represented by Sweeney's $15 a month, how do so many stores get by? It is rather remarkable that when Sweeney really wants something, he can manage to get it. The best recent evidence of this is furnished by radio. During the last twelve months, when, according to the papers, everything has been dead wrong—poor crops, low prices, unemployment, high cost of living, hoof and mouth disease, power shortage, presidential election—in fact, when things generally were about as gloomy as we can imagine, you would think that Sweeney has been having pretty hard sledding. As a matter of fact, he wanted radio, and somehow managed to scrape together $350,000,000 which was invested these last twelve months in this fad. Of course, radio is more or less in our own family, and we are not disturbed on that account, but Sweeney has spent a lot of money for other things and we would like to get part of it.

How are we going to do this? It is in order for someone to remark that you do not fish for rainbow trout with soft-shelled crabs, nor do you drive with a putter. When Sweeney begins to come in great numbers into our stores, selecting merchandise and signing orders for things, it will be because we have first studied Sweeney, found the bait that appeals to him and used that bait consistently.

About twelve years ago I was on the road. After considerable effort with one contractor-dealer who had just fitted up a very attractive electrical store I sold him one portable floor lamp. Several months later this store failed, the lamp was still in stock and my bill had not been paid.

Not long ago a department store in Los Angeles purchased two carloads of wrought iron bridge lamps with parchment shades. In the Sunday papers they offered these lamps as a special at $5.95. Tuesday morning one of our men dropped in to get one and all of them had been sold.

In the first instance, Mrs. Sweeney never discovered that my beautiful lamp was in town. In the second case she saw the notice in the paper, she wanted a lamp, it looked like a bargain, and she bought to the extent of two carloads.

This applies equally to any other article of electrical merchandise. If we wish Mrs. Sweeney to add more electrical appliances to her household equipment, we must see to it that the advantages of those appliances are attractively presented to her. If we wish to impress upon Mr. Sweeney the desirability of purchasing electrical merchandise, our sales arguments and our demonstrations must be convincing.

Sweeney Must Be Studied

Returning to the subject of balloon tires, hundreds of men, including Mr. Sweeney, discarded their old-style tires and bought balloons, not because they needed them, but because some clever merchandiser convinced them that they should have this new equipment. Whoever heard of people standing in line to buy washing machines to replace their old ones which were still useful, although not the new style? We do not want to disturb Sweeney's mode of living nor have we any desire to have him deny himself the wholesome things that he now enjoys, but it is entirely right that we should insist on getting more electrical merchandise into his home.

To accomplish this we may have to abandon some of the traditions of our business. It is my suggestion that we make a serious study of Sweeney and then adjust our merchandising scheme to his buying habits. If prices are too high, then let us lower them. If the discount is too small, let it be increased. If advertising is aimed in the wrong direction, try changing its course. If we are trying to sell through the wrong store, let us seek the right one. I do not say that any of these things is actually true, but if our investigation reveals such conditions we cannot then ignore them.

In short, let us stop "kidding" ourselves. We are no longer an infant industry. Lots of good things which Sweeney wants and which he is buying have come on the market since our leading appliances made their bow. I cannot help thinking we have lagged in the race.

Operating Data for an Electric Steel-Melting Furnace

By F. L. Landon
Power Salesman, Pacific Gas and Electric Company, Sacramento, Calif.

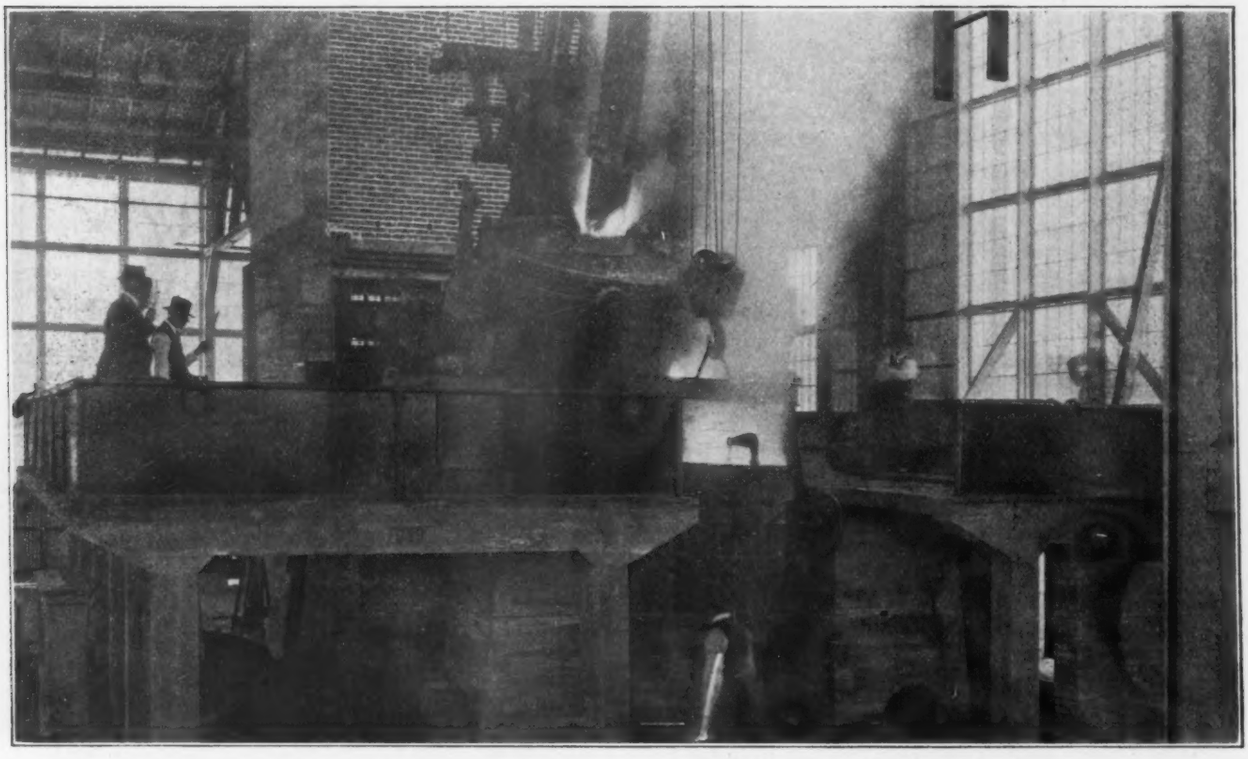
IN most industrial processes the use of electric current as a heating medium permits perfection of operation and ease of control that cannot be obtained with any other fuel. This is especially true of the melting of steel, and the resulting metal is recognized as product of a high quality. There is installed in this country at present in excess of 150,000 kw. in electric steel-melting furnaces. These furnaces require approximately 350,000,000 kw-hr. per year. Originally, most of the electric steel produced was used in making tools and fine machine parts, but in recent years the reduced cost of production has brought about a much greater use of this high-grade steel.

In the spring of 1920 the Southern Pacific Company started operating an electric furnace at its Sacramento shops, with the expressed purpose of pouring castings for locomotive and car repairs and construction. The output was not confined to castings alone, however, a considerable part being poured as ingots for the rolling mills. Tie plates, fish plates and similar products are being rolled from this steel with great success, both as regards cost of production and quality.

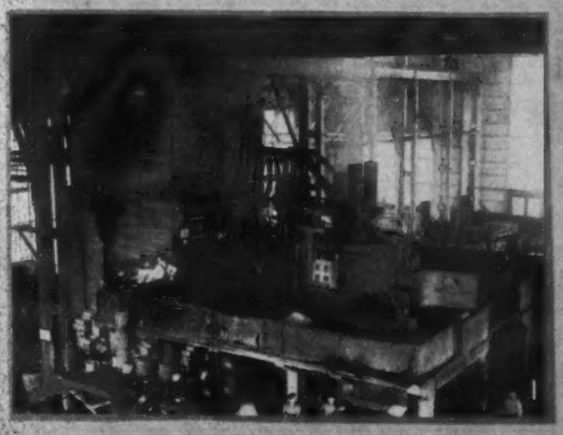
The furnace used is a 6-ton, 3-phase Heroult with a basic lining of magnesite brick. It has three electrodes of pressed carbon, which are 17 in. in diameter and weigh when new approximately 890 lb. The electrodes pass through bushings in the roof of the furnace and are supported by cantilever arms which raise and lower them automatically in response to the demands of the melting charge.

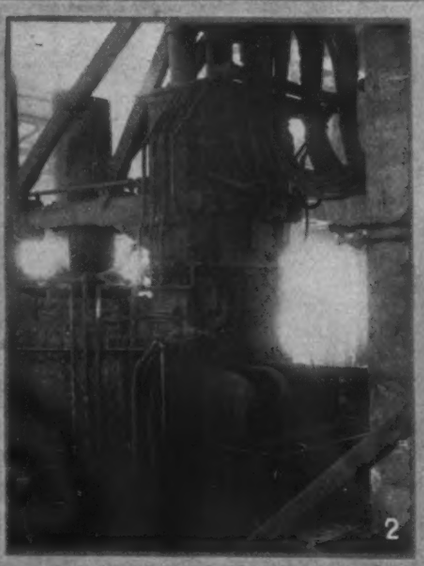
Control of the electrodes is both automatic and manual. Three control motors are supplied with 110-volt direct current from a 15-kw. generator. The automatic control consists of six solenoid-operated direct current contacts, two for each phase, one causing the control motor to operate in such a manner as to lower the electrode and the other reversing the direction of rotation and raising the electrode.

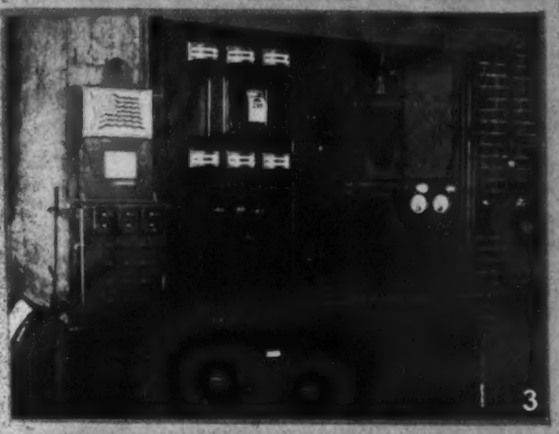
Electric energy is supplied to the foundry at 2,200 volts, 3-phase, and is stepped down through a closed delta-connected 3-phase transformer of 1,500 kva. rated capacity to approximately 106 volts. Each of the three leads from the transformer to the electrodes consists of eight 500,000 circ. mil stranded cables, making a total of 4,000,000 circ. mils per phase.



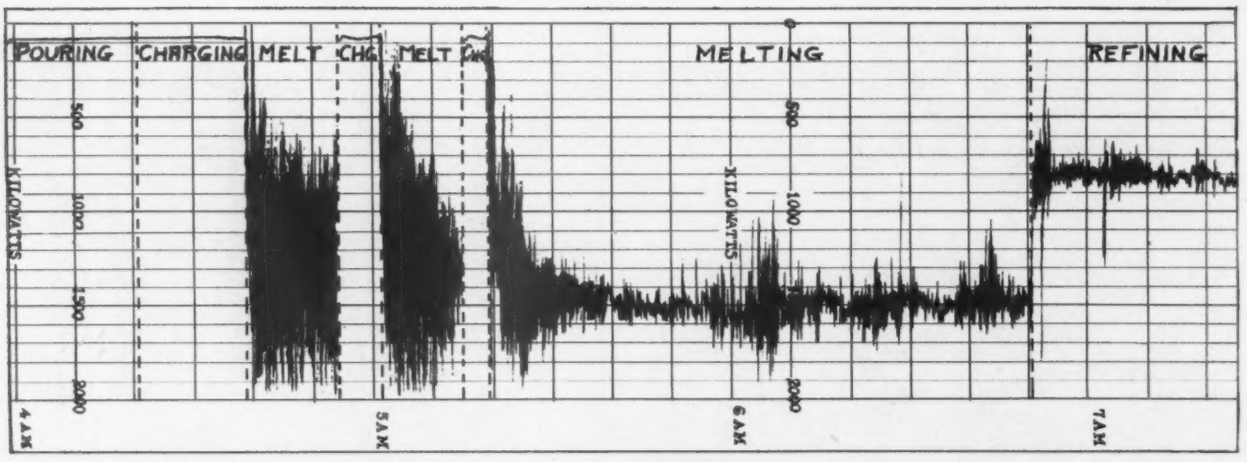
Electric steel-melting furnace at the Southern Pacific Company's Sacramento, Calif., shops pouring a heat into a 6-ton ladle.







THE Southern Pacific Company has had marked success in the operation of a 6-ton electric steel-melting furnace in its Sacramento, Calif., shops. The accompanying photographs show some of the details of the equipment. No. 1 is a general view of the furnace itself. No. 2 is a close-up of the furnace from the back showing the leads to the electrodes. A view of the switchboard and controls is shown in No. 3. No. 4 shows the spare furnace roof ready to be put in place. The lining of the roof burns out more rapidly than that of the furnace itself, necessitating more frequent changing. No. 5 shows some of the typical castings produced from steel melted in the furnace. The castings in this case are locomotive bearing journals. No. 6 shows some of the scrap used for charging, loaded in buckets ready to be carried to the furnace. In the foreground are stubs from used electrodes.



Typical load curve showing energy demand during one heat. The furnace operates continuously four to six days out of each week with a 1,750-kva. demand.

The metal used in charging is unselected scrap. However, precautions are taken to remove as much of the cast iron which may be mixed with the scrap when it reaches the charging platform as possible. Due to the small size of the charging door and to the fact that the metal is thrown in by hand, the scrap must be broken into pieces not more than 3 ft. long. A 15-ton crane operates the entire length of the foundry and carries the buckets of scrap to the charging platform. It also handles the pouring ladles.

The process of melting may best be followed by referring to the accompanying chart obtained from a recording wattmeter. The entire melting cycle may be divided into eight distinct periods.

The first two periods show no current consumption and cover the time of pouring and charging. These two intervals are of nearly equal length and, combined, cover approximately 45 min.

The charge having been completed, the first melting period begins and lasts about 20 min. During this time the current varies greatly, due to the short-circuiting action of bringing the electrodes into direct contact with the cold metal and then drawing them away to form an arc. The current is shut off for the next interval of nearly 10 min. During this time the electrodes are raised and additional scrap is added, as the melting down of the metal reduces its bulk, thus making room for additional scrap. Melting is again resumed and continues for from 10 to 15 min., the current fluctuating nearly as much as in the first period. The current is then shut off for the third and last time and a final charge of scrap added.

Test taken at Southern Pacific Company's Shops, Sacramento, Calif.

No. of days worked	No. of heats	Total tons scrap metal	Average tons per heat	Average kw-hr. per heat	Average kw-hr. per ton	Average time per heat	Average time per ton
4	31	155	5.0	2,513	567	2 hr. 29½ min.	29.9 min.
6	35	213.5	6.0	3,340	548	2 hr. 55.3 min.	28.7 min.
6	38	247	6.5	3,421	526	2 hr. 57 min.	27.25 min.
6	39	253.5	6.5	3,397	523	2 hr. 55½ min.	27.0 min.
6	37	240.5	6.5	3,438	529	3 hr. 1 min.	27.84 min.
6	36	234.0	6.5	3,467	533	3 hr. 4 min.	28.3 min.
6	38	247.0	6.5	3,468	534	2 hr. 55 min.	26.9 min.
4	25	162.5	6.5	3,440	529	2 hr. 59 min.	27.5 min.

The seventh and eighth periods are for melting and refining, respectively, and vary in length for different heats due to varying quantities of impurities in the scrap. It will be noted that as soon as the metal is well melted down the current becomes practically constant and the demand averages 1,500 kw. at an average power factor of 85 per cent. This gives a 1,750-kva. demand. When the metal reaches the proper chemical properties, it is poured into a 6-ton ladle and taken to the moulds in the various parts of the foundry.

The linings of the furnace have an average life of 191 heats, and a roof stands up for 140 heats. Repair work, such as relining, is done usually on Sundays so that the furnace may be operated continuously during the week.

The accompanying table gives figures on operation over a period of eight weeks and is an accurate record of the input in material and energy and the output of finished metal. When it is considered that these figures are entirely satisfactory from the standpoints of production cost and quality of steel, it is little wonder that the Southern Pacific Company is seriously considering enlarging its present equipment to meet its increasing demand for high quality steel.

Street Lighting Poorest and Cost Per Capita Highest in Small Cities.—A survey conducted by the United States Bureau of Standards, covering 362 cities, indicates that the poorest average street illumination is present in the smallest cities. These cities pay more per capita for this light, the average cost per capita in this group being $1.02 per year. The least cost in any group is 74 cents, in the group having a population range from 150,000 to 200,000. This group has the cheapest and the poorest lighting of any of the larger cities. In the group comprising cities ranging from 200,000 to 300,000 the costs are high and the illumination the best of any group. The cities surveyed had populations ranging from 10,000 to 500,000.

Teaching the Future Housekeeper to Do It Electrically

By V. W. Hartley
Executive Manager, California Electrical Cooperative Campaign.

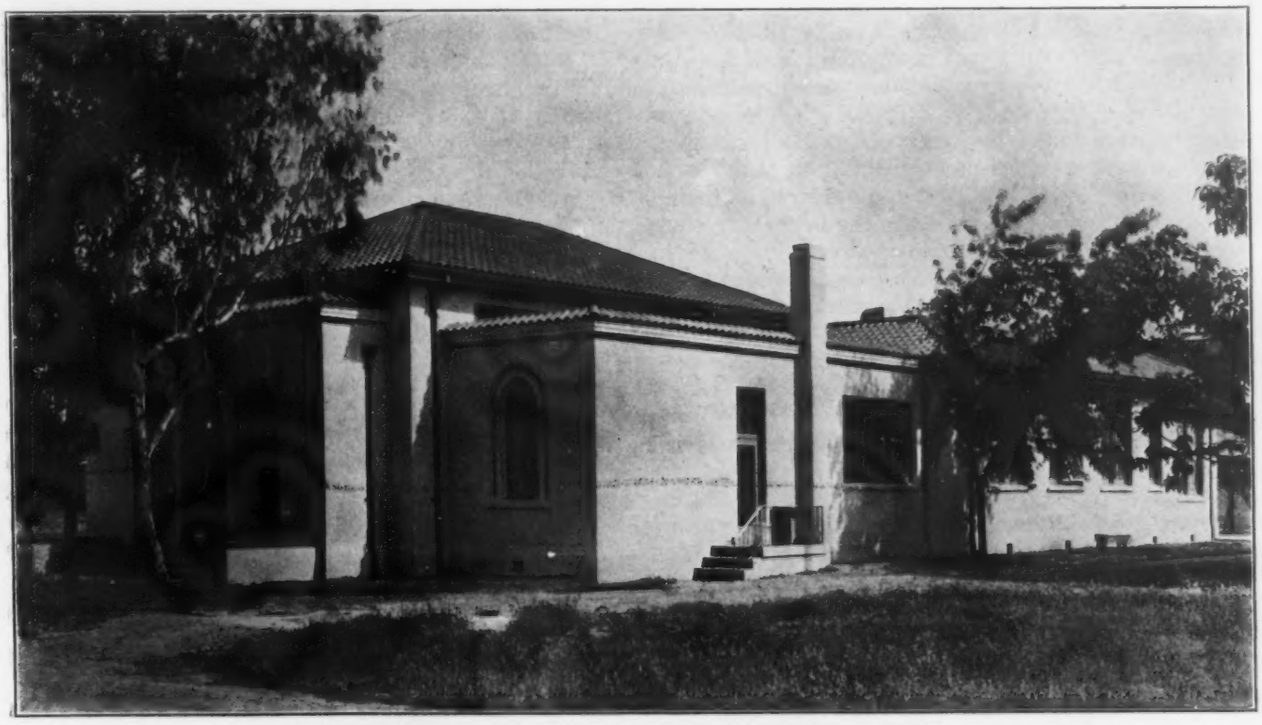
REALIZING that when a woman has once prepared meals on an electric range she will use no other method of cooking, members of the electrical industry of Exeter, Calif., have gone wholeheartedly to the support of the domestic science department of the Exeter Union High School. Through the cooperation of the electrical industry in that town of 3,000 people, an installation has been made in the domestic science building that would be a credit to any city.

The school serves a student body of about three hundred, the boys and girls coming from Exeter and farms near by. Many of the students are children of well-to-do families and will be the future family heads in that community. It is important that they should be given every opportunity to become acquainted with the most modern means of conducting business and the home.

Toward this end the faculty of the Exeter Union High School has devoted every effort and has made notable progress, particularly in the domestic science department. A separate building has been erected to house this department, and every modern convenience has been installed. An exceptional opportunity has been given to the girls receiving instruction in domestic science through the fact that the school authorities have equipped the small model kitchens, where instruction is given, with a large line of electrical labor-saving devices.

The domestic science instruction room is divided into five small kitchens in order that the girls may prepare meals under conditions prevailing in the home. Four of the kitchens are each equipped with two electric ranges and the fifth, being half the size of the larger ones, has only one range. A master switch controlling all the circuits in the domestic science room is placed at the end of the room, so that the instructor may open the circuit on all of the ranges simultaneously if she desires to do so.

Electric water heaters are installed in the domestic science building to permit the student housewives to have hot water at all times. In this way they learn the efficiency of electricity for cooking and for maintaining a supply of hot water when they are first learning the rudiments of housekeeping. In the classes conducted in the main cooking laboratory, girls in the first-year courses learn the preparation of simple, wholesome meals. All types of plain cooking are explained to the girls, and they are allowed to prepare the meals which are later served to groups from local clubs. For this purpose a small dining room has been fitted out in the building, and there the girls also learn the correct way to serve the meals they have prepared.



Exterior of the domestic science building, Exeter Union High School.

East side of the main domestic science laboratory, showing two of the booths. Two electric ranges are installed in each booth.

Classes in sewing have also been given the opportunity to learn of the electrical labor-saving devices that make it easier for the modern woman to design and make her own clothes. Electric sewing machines are provided, and convenience outlets have been placed at points to permit the use of numerous other devices such as irons which are used for pressing the completed garments. In addition, there is a laundry in which five built-in ironing boards have been placed. Outlets for electric irons are in convenient places, and behind each board is a slate-lined cabinet in which to set the hot iron.

That Mrs. M. F. Peck, the domestic science instructor, is aware of the advantages of cooking electrically and is convinced that the electric range is the solution to the housewife's quest for the ideal cooking equipment is evidenced by a letter describing the domestic science department at the Exeter Union High School. The letter was addressed to the secretary of the California Electrical Cooperative Campaign and in part reads as follows:

"We have forty girls in our domestic science department at the present time. We have two classes in first-year cooking, which accommodates thirty-six girls. Then, also, a cafeteria class or second-year cooking class. Our first-year class meets in the main laboratory, where we have five unit kitchens, each equipped with two electric stoves.

The two first-year classes learn to prepare and serve good, wholesome food. Besides doing their regular class work, the girls plan and serve luncheons and dinners to local card clubs and to the directors of the Chamber of Commerce. These luncheons and dinners are served to groups of ten or twelve. All the food is prepared on the electric stoves. These stoves have given us the very best satisfaction.

"The two things we strive for in our classes are speed and economy. Speed in cooking means plenty of heat and high heat. So we find the electric stoves far better than the old gas burners, which do not hold the heat as do our electric units. The real economy of electric cooking in schools lies in the fact that there is no coal or charcoal to handle, no ash to remove, no fire to tend; there is pure air, no smoke, no dirt, no gas burners to replace or renew, no uncertainty as to the cooking results, and there is absolute safety.

"I do feel that the time has come when there should be some type of electric equipment in every domestic science department."

The citizens of Exeter are equally well satisfied with the electrical installation in the high school, and the girls who have learned to prepare meals on the electric ranges will undoubtedly demand similar equipment in their own homes when they take up the duties of housewives in earnest. Through this installation, of which the community is naturally proud, the "electrify" message has been carried to many persons who would not otherwise become acquainted with the advantages of electrical equipment in the home. The electrical installation was made by E.M.M. Service, Inc., of Exeter, the California Electrical Cooperative Campaign assisting in the layout of the wiring and equipment.

Lighting and Lighting Fixtures

By H. H. Courtright*

Manager, Valley Electrical Supply Company, Fresno, Calif.

So much has been written on the subject of lighting and lighting fixtures that it is difficult to present material that will be new in its character and that will interest those who are familiar with the subject. Much has been written on foot-candles, lumens, watts per square foot, efficiency of different types of luminaires, etc., but little has been said of the fixture business at it pertains to that of the electrical contractor-dealer. In other words, volumes of technical information have been published but nothing has been put forward to show one whether or not he should handle fixtures and, if he should do so, how to best regulate his buying and his stock.

The electrical merchandiser, insofar as fixtures are concerned, is generally divided into four classes:

1. The electrical contractor who wires office buildings and industrial plants.
2. The electrical contractor who wires residences and apartment houses.
3. The electrical contractor who has a small store.
4. The electrical contractor-dealer who has a large retail store with several small lighting fixture show rooms or with one large room for the same purpose.

An analysis of these various types of merchandiser reveals some interesting facts and is fundamental to a proper understanding of what is necessary to intelligently deal in fixtures.

Class I

The contractor who specializes in the wiring of office buildings and industrial plants is really, in effect, an electrical engineer for he has need of considerable engineering knowledge which must be applied to an understanding of his client's business in order that he may assist in the proper application of electricity to that business for the most profitable return to the client. This type of fixture dealer usually applies a definite and predetermined fixture to each job. This is partially attributable to the fact that the lighting fixtures on work of this nature are often specified by the architect who is influenced by reasons of efficiency, individuality, artistic effect and countless other considerations. In those cases (if there are any such) where the architect does not specify the lighting fixture, the contractor may select a suitable unit and, with or without the help of a jobber's or manufacturer's salesman, he may complete the sale. These commercial units are generally sold on a small margin. This is made possible by the fact that the contractor does not buy in advance of requirement and orders only a sufficient number to take care of the need of the particular job for which they are intended. In those rare instances where the contractor does actually stock the fixtures he makes strenuous effort to move his stock and not to keep his money tied up in merchandise. He must keep his money turning or his net profit for the year will suffer. Frequently a stock of commercial fixtures on hand is evidence of a fixture that is out of date, is inefficient or that has for some other reason proved to be a poor buy. The styles in commercial lighting units change frequently and rapidly and very often those who have bought incautiously have been cought with a heavy stock on hand and have found themselves obligated to a jobber or manufacturer. For that reason, as well as for the others already outlined, it seems better judgment, unless one is specializing largely on fixtures and is therefore in close touch with developments in the fixture market, for those who specialize in the larger wiring jobs to buy fixtures only after they have been definitely specified.

Class II

The second class of contractor-dealer, who specializes in residence and apartment house wiring, frequently does business from his home or from a desk in an office where he is a co-tenant with others. His sales of lighting fixtures are usually to the owner or to a builder or general contractor. Such sales are most commonly made from a manufacturer's catalog or from the display in the jobber's salesroom. It is not at all uncommon practice for this type of contractor to take his prospect to the show room and to complete the selection and sales of the fixtures for a job at that place. Such procedure, of course, means that the electrical contractor carries no stock, has no investment in fixtures and turns his money at a rapid rate. This method of procedure has been made easy in late years by the fact that fixture manufacturers have in many instances materially reduced the number of stock items of their manufacture. In some cases this reduction in stock numbers has been from an original list of 1,000 separate fixtures down to 100 different types. This reduction in number of styles has resulted in the possibility of shipping fixtures already assembled and packed in neat cardboard cartons. This has made easier the handling of fixtures in jobbers' and dealers' stocks, has helped the stockkeeper to keep his stock in better shape, has kept fixtures free from dust and other atmospheric effect and has saved the dealer many dollars that would otherwise have bees spent on wiring up and assembling. This so-called "package fixture" has resulted beneficially to all in the fixture business as it has enabled the manufacturer to reduce production costs and has permitted the jobber and dealer to speed up turnover. These factors have resulted in lowered cost to the consumer and have, consequently, brought about increased fixture business.

From all of the above it is evident to all that this type of electrical contractor-dealer can sell from catalog or display room, place his order with the jobber and have his order delivered complete to the

*An address delivered before the convention of the California State Association of Electrical Contractors and Dealers, Santa Cruz, Calif., Sept. 19-21, 1924.

job within a few days. Because this contractor carries no stock and works purely on the principle of turnover he is able to sell fixtures on a very small margin.

Class III

The third class of electrical contractor who has an established place of business is in a dangerous position. He has an investment in wiring supplies and materials, appliances and fixtures and has a very definite overhead. If he would tie in with a jobber who carries a stock of reliable and up-to-date fixtures, drawing on the jobber as needed, receiving prompt shipment and paying for the goods in accordance with good business practice, he would be in a favorable position. However, he generally tries to carry in stock a line of from ten to fifty of each of the fixtures in his sample stock, figuring that to do this makes it easy for him to deliver the goods as soon as sold. He carries this heavy stock partly in order to avoid the routine of ordering frequently and partly to prevent a competitor from handling the same lines. This is brought about in part by the fact that many manufacturers and jobbers will, when a dealer buys a sufficient quantity of one item, confine to the dealer so ordering the sales of that particular line in that town. This practice often results in a dealer becoming overloaded with stock, running up a high overhead, getting behind in his accounts and generally getting into trouble. However, many of this type of dealer still think they can successfully follow out this practice. If the dealer would instead carry only a sample line of fixtures, keep his samples new and up-to-date and work on a quick turnover, thus working all of his capital, he would not get caught with a big stock when styles change and when business slackens.

Lighting fixtures are a very dangerous commodity to handle. If there is little or no building it is impossible to sell fixtures at even fifty cents on the dollar. The jobber will be in much better position with reference to stock and dealer credits if the dealer will carry only samples and will order as required instead of ordering in large quantities. The jobber will also be better able to gage the market when dealers follow out this practice. The dealer, therefore, is playing fairer with the jobber when he follows out the plan of carrying only samples than when he tries to carry a heavy stock.

The contractor-dealer who has an established place of business should never try to manufacture fixtures, for the fewer the types of fixture carried in stock the faster will be his turnover and the greater his profit at the end of the year. He should not, either, try to make use of a spraying machine for by so doing he is trying to match finishes and to improve on the manufacturer's product. The factory, needless to say, has facilities superior to those of the dealer for the purposes of manufacture. When dealers by accident produce a fixture that sells readily they generally proceed to load up with fixture parts and to start on the assembly of fixtures, devoting time to this work that should be devoted to their regular efforts. This immediately places their non-manufacturing competitor, who buys from sample only, in a position of decided advantage.

Class IV

The fourth class of fixture dealer is distinct and unique from all the others. He understands the business both from a financial and an artistic viewpoint and he sells fixtures on their individuality. Each home has its particular decorative scheme and its individuality and there will always be a field for selling fixtures in this way. This type of dealer will prosper as long as he adheres to the principle of selling, even to a limited market, fixtures that are distinctive and, perhaps, primarily decorative. His overhead is heavy and his turnover is slow but the margin made possible by the nature of his business offsets both of these factors.

There is a very definite field for all of the above classes of fixture dealer and so long as each stays in his particular field he should prosper. If, however, he fails to realize the limitations placed about him by circumstances and tries to enter into competition with those in the other branches of fixture merchandising, he is very liable to come to grief.

Many well-intentioned dealers have made the mistake of trying to progress too rapidly and have entered a merchandising class for which they were not fitted either by experience or by finances. Inasmuch as the class lines on fixture merchandising are clearly drawn and as the sales plans of each class differ widely in some respects from those of every other class it is essential that a dealer fit himself for following the general procedure of those in the class he proposed to enter. Very often a dealer is attracted to other fields of fixture activity by the apparent success of those already in the business but who have had many years of experience in their particular line. The matter of adequate preparation for competing with firms already well established does iot occur to him as one of the requsites for success.

One ever-present feature of fixture sales is that every building that is constructed in a territory served with electricity, or that may be so served in the near future, demands lighting fixtures and offers a sales possibility. The changes in lighting modes and equipment offer a steady and persistent follow-up sales possibility and, in reality, the building remains a prospect as long as it stands. This is well evidenced by the fact that department and other stores, clubs, hotels, halls and other public buildings, as well as many residences, change their lighting equipment frequently. Developments in the art of illumination, the application of color lighting to the home and for commercial effects, the attention to physical welfare and the increase in the number of students are all working for the more extensive distribution of lighting units. Each unit means a sale by some enterprising fixture dealer and he also has the possibility of opening new channels. Many dealers have done conspicuous work in developing fixture business even in the face of seemingly unfavorable conditions.

On the whole it might be said that the merchandising of fixtures, like the selling of anything else, resolves itself largely into a matter of common sense. It is better to be consistently successful in a limited way than to be a glaring example of what not to do.

Better Public Relations by Telephone

By R. F. Bonsall*
Consolidated Gas Electric Light & Power Company
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IN keeping with these modern busy days, the use of the telephone for the transacting of all kinds of business is rapidly displacing the personal visit. This is borne out by the fact that in the last year, in the city of Baltimore, the number of telephones has increased over 100 per cent. This applies not only to the downtown section, but to the home districts. The modern housewife sets apart each morning a certain time for the telephoning of her orders, and straightening out matters relating to the home, over the telephone; and in those houses where there is no phone the tendency has grown to use a neighbor's phone or the phone at the corner store, in preference to making a trip downtown, or for the purpose of getting quicker service.

It has been the endeavor of our company to make it as easy for the customer to do business with is as any merchandising organization, and this was one of the ideas in mind when our general service department was established for the handling of complaints and inquiries and all relations with the public along this line. Under the supervision of this department there is a general service telephone bureau, separate from our application and emergency boards, where the customer may receive the same service as he would if he were standing at the counter. There are ten positions on this board: six in use regularly and four for peak days. This board is manned by six telephone service salesmen, with a reserve of four counter service salesmen.

The calls are placed on this board by our general telephone operators, who do a limited amount of questioning; and these inquiries and complaints so received cover almost every phase of the company's operations. Applications or trouble calls are handled here also, if once placed there by the regular operator—as the telephone service salesmen are instructed under no circumstances to transfer a call. The customer holds the line, while the necessary information is secured from the person or department involved by the salesman plugging in from his own board or through the general operator. If an unusual amount of investigation or time is required, the customer's telephone number is taken, and he is called later; but in nearly all cases it is secured while he waits, except where the explanation of a high bill is asked for, requiring reference to the meter-reader's hand-book or bill schedule. The necessary information is then taken by the salesman, and customer told one of our outside service men will call to go over the case.

The men on this board receive the same training in company policies and methods as our counter salesmen; and, in addition to this training, there is taken into consideration the fact that these men are handicapped by not being face to face with their customers, thus being compelled to get their personality across without the advantage of seeing what is passing through the customer's mind as they talk. The "smile" in this phase of our work must be put in the voice; and, as telephone conversations are usually briefer than face-to-face conversations, they must also make their answers and explanations to the point, without being abrupt or attempting to cut short the customer in any way. These men, like the rest of our department organization, are familiar with the operations of the company, and have been put through our regular educational courses; that is, have accompanied our shop men through different phases of their work, have been with the other men of our department in their various operations, and through other departments of the company to learn their methods.

The men on this board also arrange for any outages made necessary by maintenance work on the distribution system. A statement of the territory affected by such an outage is furnished by the distribution department. Each customer, other than residential, is telephoned to ascertain if he will be inconvenienced by an interruption in his service between certain hours. After a common time is arranged for, the distribution department is notified. If it is more convenient to customers, the work is done on Sunday, holidays, or any time during the night. We have always found customers are ready to cooperate when an explanation is made beforehand, and made clear to them by a trained employee instead of in a haphazard way.

This board is also used to ascertain the class of service we are giving, and the promptness with which orders are executed. Each day about 25 per cent of the various classes of orders executed the day before, except meters set, are distributed to these men, who, during off-peak periods, call the customers, to ascertain if their complaints have been properly taken care of; if the repairs were made as requested; if certain goods were delivered satisfactorily. A statement of these results is sent monthly to the various departments, and acts as an incentive to better work.

A monitor board is installed in the manager's office, through which it is possible to hear the salesman's conversation with the customer, and this board is monitored by several people at various times, to learn the way the telephone service salesman deals with the customer, and to coach him afterward if necessary. The men on the board understand that this is in no way means to be a "spy" system, but is merely in line with our campaign for good service, and to broaden our educational work with them.

We have had numerous expressions of satisfaction from customers of our service rendered over this board, which results in a saving of time, energy and expense to the customer, and the increasing of the customer's good will toward the company. All indications seem to point to an expansion of this telephone service, necessitated by the increasing inclination on part of our customers.

*Excerpts from "Service Suggestions" of the Customer Relations Committee of the National Electric Light Association.

The COAST Outlet
ELECTRICAL CONSTRUCTIONISTS' and DEALERS' NEWS

A Modern Standard for Estimating Electric Wiring Contracts

By Clyde L. Chamblin
President, California Electrical Construction Company, San Francisco, Calif.

GAMBLING, alias contracting, must stop in the electrical business. This feature of the building industry is receiving the most serious consideration by all concerned. Manufacturers, jobbers and contractor-dealers alike are deeply interested. The latter particularly have come to a realization that they have been too long the pawn of the general contractor. It is now recognized that only by a definite change of business procedure can the electrical contractor-dealer in any measure insure his future. The high mortality rate and the long list of those that have failed in the contracting branch of the electrical business certainly indicate the need for such business change. In electrical contracting there are many evils that are common to other building trades, where estimates are required in advance of the start of the work. There are so many indeterminate factors, the chief of which, however, is labor, that any master electrician or master tradesman is taking chance enough merely by going into the business. To put up with other hazards; in fact, to sponsor them by means of certain trade practices, is no longer within the realm of possibility for those who wish to remain in their chosen line of work. In view of the fact that less than one electrical contractor in ten remains in business longer than five years, it seems apparent even to the dullest mind that corrective steps must be taken immediately.

Electrical contractor-dealers are faced with customs that may or may not be of their own making. However, the power to unmake these customs remains very definitely in the hands of the contractor-dealer. First, there is the fixed-fee system. This system offers no incentive whatsoever to the contractor-dealer to put forth his best efforts and apply his engineering knowledge to the job in hand. He knows definitely in advance, before he starts the work, how much he is going to get out of a job, and it is no more than natural that he should leave the completion of the work to his foremen and devote his own time to more productive efforts. This more productive effort may include the solicitation of new work or may involve supervision of a job or jobs that have been taken on more profitable basis than that afforded by the fixed-fee system. It is true that the fixed-fee system shows that in very few cases have contractor-dealers been able to establish a fee sufficient to compensate them satisfactorily for all of the factors involved. In fact, on most fixed-fee jobs the master contractor would be better off were he to don overalls and become a mere journeyman. It being definitely established beyond question that the fixed-fee system is not advantageous, it then becomes incumbent upon the contractor-dealer branch of the electrical industry to see that this system is abolished.

The next system for consideration is what is known as the "cost plus" system. General contractors frequently take jobs on a cost plus basis; that is to say, cost of material and labor plus 10 per cent. The 10 per cent of the entire cost of the building and material represents the general contractor's profit. This means, for example, that if the cost to the owner is $500,000—and this cost, incidentally, is not ordinarily guaranteed—the general contractor's profit will be $50,000. This is nearly a net profit, as he establishes a field office on the job, for which the owner pays, and his expense is confined largely to a telephone installed in this job office and to his own supervisory time. The general contractor in turn sublets the various building operations to subcontractors, such as cement workers, steel workers, plumbers and electricians. These subcontractors in turn are required to purchase materials and furnish labor for the performance of their part of the contract. Labor must be paid weekly in cash, and material bills must be paid in accordance with trade practices. This means normally that the subcontractor must stand his entire cost of a job until such time as the general contractor repays him. Payment terms on subcontracts differ, but they consistently leave the subcontractor holding the bag. It is thus shown that the general contractor is in reality doing business on the profits of the various subcontractors. The subcontractors, in other words, are acting not only as bankers but as philanthro-

pists. The general contractor can afford to do business on the cost plus 10 per cent basis, on account of his low overhead.

The situation with the electrical contractor, however, is entirely different. There is probably not an electrical contractor in the country today whose overhead is not at least 15 per cent, and in most cases it runs in excess of 20 per cent. Those who feel that their overhead is less than 15 per cent should most certainly consult an expert accountant at once, for this failure to recognize overhead is a contributing factor to the demise of over 90 per cent of contractor-dealers who fail to stay in business for five years or longer. It is therefore apparent that no electrical contractor-dealer can afford to take a job at cost plus 10 per cent, unless cost is made to include all items of overhead. Inasmuch as this is not the common basis of figuring cost—which normally includes only the cost of material plus the actual cost of labor—it is at once evident that cost plus 10 per cent for an electrical contractor is ruinous.

"Cost Plus" System Unfair

Any business contract that gives either party an unfair advantage is fundamentally wrong and is, in effect, destructive rather than constructive. Furthermore, it destroys business confidence, and without that confidence business can never succeed. The "cost plus" system seems unfair to the owner because it places him at the mercy of the general contractor. The more material and labor that are used, the more will be the general contractor's profit. The higher the gross cost, the better the job from the contractor's point of view, and the "cost plus" basis offers no incentive to intelligent buying and efficient management. Material jobbers are put to greater expense through handling small packages, broken lots and similar items, and this increased expense is reflected in the dealer's purchasing price.

Inasmuch as the general contractor is the only one who benefits from a "cost plus" job, it must be apparent even to the dullest mind that this one-sided method of transacting business must be abolished. The "cost plus" system has been fostered by general contractors, and subcontractors have followed without stopping to analyze the situation as it affects them. General contracting is not a distinct trade, as is electrical contracting, plumbing, painting and plastering, which deal with distinctive lines. A subcontractor's cost of doing business concerns no one but himself, and there is no reason why this information should be placed in the hands of a general contractor or a building owner. Manufacturers do not tell jobbers what their production costs amount to, nor do jobbers tell contractor-dealers their merchandise costs. A shoe dealer getting $10 for a pair of shoes does not tell what he pays for them, nor does a tailor state the cost, to him, of a finished suit of clothes. There seems therefore no logical reason why the electrical contractor-dealer's costs should be broadcast by taking a job on a "cost plus" basis. It is not intended by this statement to indicate that electrical contractor-dealers should be or are guilty of sharp practices or excessive profits. The general hazards of a contracting business are great, but the public at large cannot understand any allowance that might be made as a factor of safety.

After several years of study of the situation, including an analysis of the reasons for the early business death of many contractor-dealers, a system of estimating has been evolved that to a large degree eliminates all uncertainties. This system has been compiled in the so-called "Electrical Data and Sales Book." Briefly, this book contains a list of all items used in electrical construction, together with their proper list selling prices to insure reasonable profit, and it further provides discounts that may be applied to large jobs consistent with good business practice. This book provides all of the necessary information for estimating a job of any size, including extras. This system seems eminently fair, both to the owner and to the contractor-dealer, as it establishes definite prices on material and assures a fair selling price, while at the same time a sufficient allowance is made in computing data book prices to cover overhead and supervision. The book is convenient in form and is arranged for facility in checking invoices, as well as job costs. The service furnished in connection with the book keeps it up to date and consistent with current market prices.

In order to insure accuracy of the prices shown in the electrical data and sales book, as compared to current market costs of materials, manufacturers and jobbers keep the publisher informed of price changes; for example, the jobber notifies the publisher of the data book of the current prices on wiring materials and supplies. Then, with the exception of such items as lamps, heating devices, vacuum cleaners, motors and fans, which are sold at manufacturers' list prices, the publisher of the data book suggests a fair retail price for specific wiring operations, taking due cognizance of overhead expense and legitimate net profit. It has been the experience of most contractor-dealers that the average overhead is 24 per cent of gross sales, and that if the contractor-dealer is to be successful he must have at least 10 per cent net profit. It therefore seems self-evident that in order to obtain this profit it becomes necessary to increase the trade selling price by about 52 per cent. Any contractor-dealer who is doing business on less than 10 per cent net profit is certainly in a poor way financially, and no way has yet been evolved to produce this 10 per cent net without marking up the selling prices of materials 52 per cent.

Operation on Data-Book Basis

Many contractor-dealers who are somewhat handicapped by lack of sales experience have hesitated to approach their customers on the basis of the data book. However, it seems to be human nature to pay a proper price for any article commensurate only with the value the article has or will have in the mind of the purchaser. On this basis it is not difficult for any contractor-dealer to quote successfully on the basis of data book prices. Some electrical contractor-dealers have even gone to the extent of furnishing the data book to builders and have subscribed for renewal sheets for the use of the builder.

This has kept the builder supplied at all times with the same price information available to the electrical contractor-dealer. When such contractor-dealer secures a wiring job from such builder, he arranges to deliver to the builder's foreman a material slip showing all material delivered on the job. He also makes out duplicate time cards of his men on the job and delivers them to the builder's foreman. In this way the builder is kept fully informed at all times as to the progress of the electrical contract. At the end of the month this electrical contractor bills the builder for the material in accordance with slips already presented, and for labor in accordance with time cards. This enables the builder to check prices of the work as billed by the electrical contractor against the data book. This seems to offer the only absolute check for the builder as to the progress and cost of electrical work. In certain cases where the material cost has been considerable, say, for example, $2,000 or more, some contractor-dealers have made a practice of passing on to the builder the extra discount, or a portion of the extra discount, received from the jobber for quantity purchase. This practice of passing on the discount, however, has not always been followed. Its application must be left to the discretion of the individual contractor-dealer.

The plan as described seems to offer a basis of operation that must make for the unlimited confidence of all concerned, and it should go a long way toward eliminating the many deceptions, hardships and even financial losses that have been the history of electrical contractor-dealer operations in the past. For the guidance of those who may desire to apply it to their particular business, a form of contract based on the plan outlined and one that has been worked out by some contractor-dealers who have operated on a data-book basis accompanies this article.

AGREEMENT by and between ....., party of the first part, and ....., party of the second part, dated ....., 192....:

The party of the second part agrees to furnish electrical material and equipment for the mechanical installation as directed, in the building of the party of the first part, located at ....., ..., and to install same with expert mechanics as fast as the building structure will permit. All material to be of the best grade, of reputable manufacture, and subject to the approval of the party of the first part or his representatives.

The party of the second part agrees to remove for cause any mechanic who in the judgment of the party of the first part, or his representative, is unqualified, and to keep his mechanics on the job covered by the Workmen's Compensation and Public Liability Insurance at all times.

The party of the second part agrees to deliver to the party of the first part, or his representatives, material slips with each delivery of material to the job, and duplicate time cards of all mechanics employed on the job.

An invoice covering the material and labor for the preceding month will be rendered by the party of the second part, as shortly after the first of the month as possible, and the party of the first part agrees to pay for same in accordance with the prices published in the Pacific Coast Electrical Data and Sales Book of current date, less a discount of ..... per cent (.....%), and labor at the rate of one dollar and fifty cents ($1.50) per hour net.

.....
Party of the First Part.

.....
Party of the Second Part.

Doing Things Better Electrically

THE applications of electricity are so many in number and so varied in character that it is not uncommon to have something new brought to our attention at frequent intervals. In many cases these seemingly new applications are really not new at all but will prove on investigation to have been employed for long periods of time. Frequently there are located applications of electrical energy that are so strikingly simple in their effectiveness that they cause us to wonder why we have not made a similar use. This is particularly true in mechanical operations and it is, perhaps, a question whether every mechanical operation cannot be performed in a better way by the use of electricity. This article gives some very simple yet very practical uses of electricity and shows in a limited measure the almost infinite possibilities of electrical application.

Signals in a Flour Mill

In a flour mill, all the bins for the different grades of flour are on the top floor. Screw conveyors in the bottom of each bin cause the flour to flow down a chute to the floor below where it is blended together and thoroughly mixed. The flow from each bin must be steady in order that the blend may be uniform. The motor control and operating levers to the bins are on the lower floor and the problem arose how to let the blender know if one of the screws jammed, as often happens.

A metal case, similar to a lamp annunciator, was made, large enough to take a 15-watt lamp in each pocket, and there was one pocket to each screw conveyor. On the end of the screw shaft, which extended outside the bin, a trigger was mounted, and as the shaft revolved this trigger operated a make and break single pole switch mounted in a box alongside. As long as the screw revolves, the lamp corresponding will flicker, but if the screw stops the lamp will burn steadily, or be out altogether, according to the position of the switch when the screw stops. Simple? Yes, but the simpler things are harder to discover sometimes than those that can be worked out by mathematics.

Push Button Controls

There is a building in which a number of motors driving the ventilating system are in penthouses on the roof. The motors are d.c. and brush trouble on one of the motors set it on fire. This fire burned briskly until discovered by a passer-by on the street. The occurrence of this fire raised the problem of devising a plan to warn occupants in the building of any overheating or dangerous rise of temperature in the penthouses. A thermostat was placed over each motor, set at the desired temperature, and a pair of

wires run down to an annunciator in the engine room. Whenever the temperature of a motor reached the degree set on the thermostat it immediately registered on the annunciator, and was a great safeguard against fire hazard. Another feature of this system is that the motors are all started from the ground floor by push button control. The rheostats are solenoid operated, and on one occasion the arm did not pull clear over to the full running position, which meant that the resistance of the section still in series with the motor was burned out.

The danger of this was overcome by arranging contacts on the face of the rheostat at the extreme running side, and by attaching an extension on the traveling arm these contacts were shorted when the arm had reached the running position. This lighted a small red lamp at the button location and after pressing the start button it was only necessary to wait till the lamp lighted to know the motor was running O.K.

Such rapid strides have been made in the adoption of the push button control for motors that it is reasonable to predict the early discarding of the manually operated starter, both for a.c. and d.c. motors. The many advantages of push button control over the old type have been so generally advertised by the manufacturers that it hardly seems possible to mention any additional uses.

Remote Control and Safety Combined

The average plant employs men who have not the least idea of electrical machinery, and the strains put on motors by improper starting have caused many a rewind, with resultant expense, both as to the cost of the rewind and the loss of production. The push button absolutely eliminates this hazard. The motor always gets the right amount of current at the right time, and it stands to reason that this means prolonged life.

Probably one of the strongest points in favor of push button control is the advantage of being able to place the start and stop buttons at as many points as may be desired, and at a minimum of expense. Large printing presses have been equipped with this type of control for a long time, but in most cases direct current was used. Now by using slip ring motors, practically the same speed control can be obtained on a.c. motors, and push button control can be recommended for all classes of service.

Automatic Motor Control

As an example of this development, we have in mind a large bread mixer, run by a 35-hp. two-phase motor. A button is pressed and the motor runs for a predetermined speed for a predetermined time, then automatically picks up to full speed and after running a certain length of time, stops. Each operation can be set on the control board and thereafter buttons only are handled. This means that all batches of dough are mixed exactly alike, the human element not entering into the process.

Control of Belt Conveyors

Another application is on belt conveyors. By arranging a trigger to press the stop button when goods are not removed at the proper station, or if the belt becomes jammed, the motor stops and upon removal of the goods immediately resumes its way. There are several similar applications that can be made in connection with conveyors of different types. The whole industry is striving to make electricity safe and fool-proof and a reliable servant of man. The development of push button control of motors is a substantial contribution.

Externally Operated Switches for Switchboards

Since the development of the externally operated switch, this type is being more generally used for industrial and commercial meter boards and distribution centers. Several methods have been adopted for their arrangement, the cheaper way being to screw them on wood backing and tie them together with metal troughing.

A better type of board is made by building up an angle iron frame, on the same order as for a slate board, and covering same with heavy sheet iron. The troughing is carried along the back of the board and all conduits enter the switches from the back. The entire front, including switches, can then be painted black, gray, or any other color desired, and this makes a very neat and workmanlike job.

The principal advantages of this type of board are that a switch can be replaced in a minimum amount of time and that by extending the troughing with the feeder beyond the present requirements, future switches may be added without upsetting the rest of the board, and no idle investment in unused switches is required.

While some contractors use nipples and condulet fittings for carrying their feeder bus between switches, metal troughing will be found to be a great deal easier to install. It gives more space to work in, and makes a job with just as pleasing appearance. Also, by carrying the trough from the main switch and bringing the meter loops up through porcelain bushings, a neater job is made than by bringing the wire out of the service switch open, as is often done.

Why Oversize Switches Heat

While discussing switches, it might not be amiss to mention the necessity of well soldered lugs where heavy loads are carried. It is not uncommon for switches rated well over-size for the load carried, to heat badly. This is caused in most cases by the wire not being properly soldered in the lug, or by the lug not being clean at the contact surface. The secret of a properly soldered lug is to have the wire and lug thoroughly cleaned and hot before soldering. If either the wire or the lug is not heated through, the solder will not stick to the entire surface, and this lessens the electrical conductivity, and heating of the switch may then result. Repeated heating and cooling of the fuse clip end of the switch usually results in a loss of temper, the clip does not then make a close contact with the blade of the fuse and a complete failure of the switch follows.

Neatly arranged switchboards, whether at the meter or distributing center, are the best visible signs of good engineering, and a well designed board becomes a permanent advertisement for the contractor.

A Practical System of Accounting for Contractor and Dealer

By F. V. Mitchell

IN the Nov. 15 issue of the Journal of Electricity was printed a Sample Cash Book-Journal showing use in recording daily cash transactions and invoices taken into Accounts Payable during the month, and attention was called to the fact that the book was ruled off at that point, to be followed by the monthly closing journal entries.

To avoid confusion and at the same time make the source of the entries appear clearer, instead of presenting all the monthly closing journal entries they will be inserted step by step, particularly after the presentation of a form from which an entry should be made. For example, in the Dec. 1 issue the Sales Summary and the Summary of Returns and Allowances were outlined in Figs. 1 and 2, respectively, and the following are the monthly closing journal entries referred to and made therefrom:

Description.	Acct. No.	Dept. No.	Dr.	Cr.
Accounts Receivable	3		$684.90	
Sales Account	50	3		$684.90
Store charges, month of October, 1924.				
Cost of Goods Sold—Material	52A	3	472.50	
Merchandise Account	10	3		472.50
Cost of store charges, month of October, 1924.				
Accounts Receivable	3		5,984.00	
Unfinished Contracts	16	1		5,984.00
Wiring job charges, month of October, 1924.				
Accounts Receivable	3		2,547.00	
Unfinished Contracts	16	2		2,547.00
Fixtures job charges, month of October, 1924.				
Returns and Allowances	51	3	63.50	
Accounts Receivable	3			63.50
Store credits, month of October, 1924.				
Merchandise Account	10	3	38.50	
Cost of Goods Sold, Material	52A	3		38.50
Cost of store credits, month of October, 1924.				
Returns and Allowances	51	1	201.00	
Accounts Receivable	3			201.00
Wiring job credits, month of October, 1924.				
Returns and Allowances	51	2	129.00	
Accounts Receivable	3			129.00
Fixtures job credits, month of October, 1924.				
Cost of Goods Sold, Material	52A	3	229.15	
Merchandise Account	10	3		229.15
Cost of cash sales, month of October, 1924.				

No detailed list of the latter amount was contained in the Sales Summary, as there is no necessity of summarizing the Cash Sales, the total amount of same being obtained direct from the Cash Sales column of the combined Cash Book-Journal, and the total amount of the costs for the above entry can be ascertained very readily by preparing an adding machine list of the costs of the items as appearing on Cash Sales Tags. The thought may occur that, to expedite matters, the total amounts for all the other above entries could be obtained through the preparation of adding machine lists instead of a Sales Summary as outlined, but this information is so important for reference purposes in connection with charges that the latter method will be found the more expedient in the long run.

Another reason for the preparation of a Sales Summary is that it can be used to good advantage in effecting a daily proof-posting method of the entries to customers' accounts. For example, the Store Charges are entered daily in the Sales Summary from the office copies, and the Selling Price column should be totaled in small pencil figures to that point. The amounts are then posted to the customers' accounts from the office copies, and markers are left in each customer's account to which a posting has been made, from which an adding machine list is prepared of all the accounts posted on that date. For the first day of each month, the total of this adding machine list should equal the total of the Selling Price column at that date. For each preceding day of the month, the total of the adding machine list should equal the difference between the final total and the previous day's total of the Selling Price column. The Job Charges, Store Credits and Job Credits would be proof-posted in the same manner. This same method should be used in posting the entries from the Accounts Receivable Dr. and Cr. columns and Accounts Payable Dr. and Cr. Columns of the Combined Cash Book-Journal. This constitutes a definite proof that the correct amounts have been posted to the individual accounts and practically insures the exact agreement of the subsidiary Accounts Receivable and Payable ledgers with the respective General Ledger Controlling Accounts at the end of each month.

The next step in the monthly closing routine is the distribution of the Payroll for the month. It will be recalled that the number of hours worked on each job was entered on the Job Cost Sheets from the Daily Time Cards, and that a list of the total labor along with the material put into jobs during the month was prepared from the Job Cost Sheets at the end of each month. Due to the fact that the overhead on the jobs cannot be entered on the list at this point, an illustration of it will not be presented in this article until it can be completed, to avoid the necessity of repeating the form. How-

ever, the total amounts of the Labor columns of Departments 1 and 2 that will appear on it are used in the following monthly closing journal entry:

Description.	Acct. No.	Dept. No.	Dr.	Cr.
Work in Process Account	15	1	$1,411.25	
do.	15	2	402.50	
Salaries Account	70	1	773.25	
do.	70	2	549.50	
do.	70	3	175.00	
Accrued Payroll	32			$3,311.50
Distribution of payroll, month of October, 1924.				

It will also be recalled that the number of hours worked by each workman was entered on the Weekly Payroll Record from the Daily Time Cards, and the amount remaining unpaid on this record at the end of each month should equal the credit balance appearing on the Accrued Payroll Account No. 32 in the General Ledger at the end of the same month. The credit balance in this account at the beginning of the month represents the amount of previous month's payroll unpaid at that date. The account is credited with the total amount of payroll accrued during the month as contained in above entry, and is debited with the total amount of payroll paid during the month from the combined Cash Book-Journal. Therefore, the credit balance shown in this account must necessarily equal the total amount of unpaid payroll as shown on weekly payroll record, to constitute a definite proof that all the labor has been charged to jobs properly.

As the information is required for the departmental distribution of some items of overhead and also for the Provision for Doubtful Accounts entry, it is necessary at this point to ascertain the total amount of jobs finished during the month. Due to the fact that these data are obtained from the Work in Process Summary and other parts of it cannot be completed at this point in the closing routine, the illustration will not be presented until that time to avoid repetition of the form. However, the following monthly closing Journal entry will be prepared from the total accounts contained therein:

Description.	Acct. No.	Dept. No.	Dr.	Cr.
Unfinished Contracts	16	1	$5,867.50	
do.	16	2	2,476.00	
Sales Account	50	1		$5,867.50
do.	50	2		2,476.00
Job finished during month of October, 1924.				

All entries have now been made affecting Sales Account and the following Doubtful Accounts Provision can be made, as well as the Provision for Depreciation entry:

Description.	Acct. No.	Dept. No.	Dr.	Cr.
Doubtful Accounts	63	1	$56.65	
do.	63	2	23.50	
do.	63	3	6.20	
Provision for Doubtful Accounts	3A			$86.35
1% of net charge sales, month of October, 1924.				

Description.	Acct. No.	Dept. No.	Dr.	Cr.
Depreciation	62		$119.55	
Provision for Depreciation—				
Automobiles	20A			$69.50
Furniture and Fixtures	21A			33.35
Tools and Equipment	22A			16.70
Monthly depreciation, October, 1924.				

A Glance Into the Future

By H. N. Nelson

Enterprise Electric Works, San Francisco, Calif.

WE have just passed through a business condition upon which we may well take time to reflect. Fortunately most of us have come prosperously through the seeming depression and have, by the exercise of discretion and good judgment, placed ourselves in strengthened position. We have, too, increased the spirit of friendly cooperation in competition and have established a regard for the real principles of business. The period of slow business, instead of being a detriment to us has really been a benefit if we can now recognize the handwriting on the wall and can properly interpret what we see there. One of the things that has been accomplished is our establishment on a sound basis with clear-cut policies and a common understanding. Another big accomplishment is the reorganization of the California State Association of Electrical Contractors and Dealers and its steady, substantial expansion.

However, despite the excellent progress made under what have seemed unfavorable conditions, we must not be too confident and we must not proceed except with due care and with ordinary business precaution. It is necessary to view the future dispassionately and to take stock of the constructive effort required to so strengthen the position of each member of the industry that no future business conditions can react disadvantageously.

There seems little doubt but that competition will increase. The natural increase in population and the attendant entry into the business field of more and more individuals and companies, the extensive building program, both residential and industrial, under way in this section and the abnormal use of electricity in the Pacific Coast territory, all will tend to bring about a rapid growth of firms engaged in the electrical business. This is particularly true of those engaged in wiring and sales. It therefore be-

comes incumbent upon each man in this business to ensure himself of good business conditions for the future. This does not mean that he will provide new buildings to be wired or that he will build new factories, but it does mean that he will so conduct his business that it will be able to withstand any financial storm that may arise. It is necessary to recognize at once that the day of easy money is past and that the future is to be built on competitive effort. This will mean close attention to all those fine details of business that have always accompanied success and will mean that the loose-minded individual cannot hope to succeed or prosper.

Winners in Race Must Heed Rules

The matter really seems to resolve itself into this: all members of this industry are starting without handicap. The race is bound to go to the fittest. Only those will be fit, and will stay in the race, who heed the rules of the contest. These rules are the rules of ordinary good business and their observance means success. Failure to observe these simple tenets means business obliteration. The business roster is filled with the names of those who have been overwhelmed by the wave of oblivion that followed a course of carelessness. This business race, then, is bound to go to those who prepare themselves; who, in other words, "train down" for it.

Preparation for the contest will consist, among other things, in building a sound credit foundation. Such a foundation can only be built by pursuing ethical business tactics with due regard to costs, quality of work performed and fair competition. Those who have not conserved their resources and who have not exacted a price for their work in keeping with the cost of production are bound to be hurt during a period of repressed activity. Those who have kept accurate records of their costs and have charged for services in accordance with their real worth, thereby permitting the establishment of a reserve fund, will find that they will gain more in the long run than the profit on the business they lost to cut-price competitors. No real good ever came from price cutting and, in the electrical business, much real harm has been done. This one characteristic has been the cause of many of the contractor-dealers falling behind in the race and has resulted in their ultimate withdrawal. Nevertheless, there have been many who failed to profit by the experience of those who have gone before and each day sees some new one who is willing to learn only from experience that unsound policies cannot be followed successfully.

Marked Need of Cooperation

The responsibility for the pursuit of legitimate business practice rests equally upon all branches of the electrical industry. The contractor-dealer, jobber, manufacturer and power company are alike involved in seeing that all branches of the business are conducted ethically and with due regard for honesty and fair dealing. They are alike concerned in the success of each other and each must bear in mind that all the others are as necessary to the development and application of electricity as is his own branch. For that reason each must meet the others in absolute fairness and with confidence undefiled by doubt or fear. It is, therefore, necessary, first, to purge from the mind all thought of unfairness, of uncleanness and of uncertainty as to relations within the industry. This having been done, a long step will have been taken towards the stabilizing of what should be the fastest growing industry in the world and one that should be profitable for all engaged therein.

There has been, in the past, some distrust on all sides. Manufacturers, jobbers, central stations and contractor-dealers have alike been prone to look askance at each other and to complain without offering to construct. Until lately few, indeed, have been disposed to take the time for constructive thought and effort. The time for doubt and distrust is past and the future, if the electrical business is to grow as other businesses have grown, must be marked by a strong pulling together in a spirit of cooperation such as has never yet been developed within the industry. Certainly there is need enough for this cooperation.

Too Many Contractor-Dealers

In an analysis of the situation we find, starting with the contractor-dealer, that there are too many firms engaged in this branch of the business. Many of those who are trying to function in a contracting capacity are unequipped mentally, financially and morally to fulfill their obligations to society and to the general economic organization. Some of the contractor-dealers now in business have been urged to start out for themselves by a picturization of enormous profits and easy money, this picture having been painted by some one who wanted to make a new customer. Too often it has happened that such a man entered business in a place already well served by those who really understood their business and who were trying conscientiously to serve the public at as reasonable cost as circumstances would permit. The entry of a new firm did not create new business but did result in the finer division of what business the community afforded and, ultimately, generally resulted in a war of price cutting, unprofitable transactions, deferred settlement of supply bills, impaired credit and, too often, finally bankruptcy.

It is indisputable that the burden of bankruptcy is not borne by the one who failed, nor yet, generally, by the wholesaler that supplied the goods. The cost of bankruptcy and credit losses is charged to those firms that pay their bills in that such losses are added into the cost of doing business and are thus taken account of in the establishing of resale prices. It may be that goods will be no higher next year than they were last and thus the cost of credit losses is not seen. However, no one can tell that the cost of goods would not have been less next year had last year's losses been less.

Cost of Service

This is true, too, of the cost of service. Pick-ups, rush deliveries, telegrams and long distance telephone calls all help the mounting cost of service and

are reflected in the price of merchandise. The contractor-dealer can himself help to reduce the cost of his own goods by the mere expedient of applying to his business the simple process of an established routine in purchasing. One of the large jobbing houses on the Pacific Coast reports that a high percentage of its sales is less than $25 on one order and that on such orders they actually lose money. The natural result of this situation is that the man who buys more than that amount of goods at one time is helping to pay the losses on the volume of small orders. The answer is not to increase the number of small orders but instead to order systematically so that materials may be assembled in larger groups and the service cost thereby reduced. The small orders are largely due to carelessness and oversight. By ordering at stated times in the month and by keeping a want list, the business of purchasing, stock keeping, accounting, handling, drayage and many other items, will be greatly simplified. To order always on the twenty-fifth of the month, for example, for shipment on the first of the following month, allows the jobber to gather the various items together, to fill in any items on which he may be short, to ship in fewer packages thus saving freight charges as well as drayage costs, and saves on many of these costs on the receiving end.

Why Contractor-Dealer Needs Help

It is perhaps true that no other branch of the industry requires so much assistance in the conduct of its business as does the contractor-dealer. When one considers what has been said above relative to the establishment of this type of firm it is not difficult to understand why this is so. The need for assistance having been established, it becomes incumbent upon the jobber and manufacturer, as well as upon his many representatives, to bend every effort to strengthen the weak member. Perhaps some form of education is most needed although it may not be pleasant to hear the need called "education." We all like to think we know it all.

The reasons why the contractor-dealer particularly needs more help than other branches of the electrical industry are fundamental. In the first place the contractor-dealer is frequently a man who is an excellent mechanic but who has had little other preparation for a business career. He has been led to enter business for himself by the success and prosperity of others in his line and by a laudable desire to better himself. Frequently his action in becoming a master workman instead of a journeyman is commendable and justified. More frequently, perhaps, he is committing a grave error. This latter is very apt to be the case when he has been urged to enter a field already well covered. Unfortunately this has too often occurred. Many jobbers who were not getting as much business as they felt entitled to in a certain town have looked over the list of potentially eligible men elsewhere who were either dissatisfied with their existing position, working conditions or location and have sponsored their entrance into the contracting and merchandising field in the city where sales volume was unsatisfactory. This has been done on the theory that the jobbers' volume from that city would show an increase. Circumstances have too often proved, however, that the advent of a new firm did not increase the gross volume of the community but did result in more finely dividing the existing business. Then has often followed a long period of price cutting, unethical tactics, hard feelings, delayed settlement of bills, impaired credits, bankruptcy and general disrepute for the electrical business generally. This has happened so many times that it is to be wondered at that the lesson has not been more generally learned that it is unwise to foster men into business who have not been properly trained in the fundamentals of business procedure. The importance of accurate accounting and of making each transaction show a profit cannot be learned in a day and the failure of many contractor-dealers can be traced directly to their lack of understanding of the need for these two essentials.

Business Training Essential Factor

An important thing, then, in connection with improving conditions and stabilizing the contractor-dealer structure is for the jobber and manufacturer to recognize the need for more men who are trained in business procedure rather than for more men. A wireman **may** make a good business man—in time—but the chances are that he will always be better off socially and economically in his chosen sphere and that the function of merchant will be better performed by one who has had training in the business of merchandising but who may have to start at the beginning to learn electricity. The economics of business procedure are fairly constant, regardless of the kind of merchandise handled, and one who has had experience in merchandising has a much better chance of being successful in the selling of electrical devices and service than has one who knows little of sales management. The need, therefore, seems to be for the entry into this business of those who are trained to exact a legitimate profit in return for their wares and their services. This seems to be particularly true because of the fact that so many of the contractor-dealers, both past and present, have apparently persistently refused to heed the warning that has been so often sounded and are still trying to proceed without regard for the financial side of business. A banker never figures to lose on a transaction or to do business at cost, hoping to make up the deficit on "extras." It seems queer that this lesson has not yet come home to the electrical contractor-dealer and that he has not yet learned to do business at a profit, only.

Basis for Future Success

The future success of this business seems, then, to be predicated on a better understanding and practice of merchandising principles and on a better standard of business procedure together with a more human relationship existing between competitors. To that end all of us in the electrical industry must work together for the common good.

JOBBER, DEALER AND SALES AGENT

Building Extra Profits With Non-Electrical Lines

S. & H. Service Electric Company Uses Sidelines of Colored Glassware and Gas Appliances as "Leaders"

The answer to the problem of what the electrical dealer should do to supplement the narrow margin of profit on electrical goods is to carry other types of stock as a side line, according to R. E. Heerman of the S. & H. Service Electric Company, Alhambra, Calif. Mr. Heerman's own business includes both his retail shop on the main street of Alhambra and an electrical contracting business which covers a large field in the thickly populated territory in the vicinity of Los Angeles.

In the fall of last year, he determined to extend the scope of his stock and added a line of gas appliances. Later he experimented with fancy glassware, flower holders and other items of household interest. Gas equipment is a particularly satisfactory line for the electrical merchant, according to Mr. Heerman. The dealer is familiar with the problem of merchandising in a similar field, and finds no difficulty in transferring his efforts to the allied line. In fact, he states, gas appliance manufacturers have come to look upon electrical dealers as particularly desirable agents for their wares, and will favor this outlet over others in the same community, in many cases granting an exclusive agency in the face of other applicants.

This, Mr. Heerman feels, is because the electrical dealer has had, as a rule, a difficult time to succeed in his own line, and if he has made good can be looked upon as a merchandiser of the first class. This means that he will not merely place the goods on display and sell to such as come into the store, but that he will put an effort into the making of sales and thoroughly cover his community. In return, the margin on gas appliances is considerably higher than the usual run of electrical equipment, and it does not require servicing. He points out that the gas range, once connected, is never heard from again, except as its owner wishes to commend it—a fact which means a great saving when the total costs of doing business are figured.

Another line which makes a most excellent window feature is the less expensive type of colored glassware. Experience over the Christmas season brought him to the conclusion that the more expensive ware attracted fewer people to his shop, and in every way brought less satisfaction. A few well selected items, however, which will add a decorative touch to the window and counter and which can be sold at attractively low prices, will pay well in themselves, and will bring many people into the store, thus adding to the other trade. As an example of what can be done in this respect, Mr. Heerman cites a green fruit bowl which he bought in some quantity and sold at 100 per cent gross profit. Even this figure, which, after the deduction of overhead costs, still brought in a greater proportional return than his regular stock, was greatly lower than the price at which the bowl was sold in department stores and home furnishing stores in Los Angeles. Large numbers of people were attracted by the advantageous price, and came in to make the purchase after looking elsewhere.

The store which occupies a downtown location must be assured of an active turnover. Rents are high and must be met by a correspondingly large volume of business. Obviously a diversity in the stock handled is an aid in bringing the customer more frequently into the store and hence in increasing sales. It would, of course, be no advantage to handle a line of goods unallied with the electrical stock, which would require a division of interest, but gas appliances and household ware, in Mr. Heerman's opinion, meet the need without requiring an undue additional effort.

The result of the experiment has been not only to add a profitable business to that already done by the store, but very largely to increase the sales of electrical goods, owing to the greater store "traffic"—that is to say, the greater number of people exposed to sales temptation by being brought within sight of counter and shelf displays, not to mention the tactful sales argument of the proprietor.

Since the Christmas period of last year, a large part of the firm's advertising has been devoted to familiarizing the public with the fact that household equipment other than electrical is carried by the S. & H. Service Electric Company. Besides a very attractive business in the new lines handled, Mr. Heerman has found a marked increase in his electrical trade, which has this year set a higher record than at any other previous period.

The retail establishment of the S. & H. Service Electric Company, Alhambra, Calif.

KRIS KRINGLE KNICKED

By Joe Osier

Dear Santa Claus:

As perhaps you know, Bill Shakespeare, that celebrated catch-as-catch-can word wrestler, in an idle moment once said: "There is a tide in the affairs of men which, taken at the flood, leads on to fortune; omitted, all the voyage of their life is bound in shallows and in miseries." And—

Because I believe this saying to be the truth and nothing else but—

The business of knicking Santy!

I intend to take advantage of this outgoing Holiday tide and do my Christmas shopping early.

So here are my modest wishes, dear Kris:

During the coming year, I want you to bring me plenty of volume, good prices, ample stock which can be easily replenished and sufficient competition to keep my conscience clear.

I want you to bring me honest, hard-working, loyal employees—the sort of employees who will be interested in my business and their own future—employees who will be wide awake for a full eight-hour shift and who will tell time by the sun and not by the clock.

Also, Santa, bring me up-to-date customers—folks who have plenty of pelf and who will not be satisfied with anything less than the best. Bring buyers who buy and send those who are looking for check figures elsewhere.

And, while you are distributing your largess, bring me a fresh stock of determination—the will to hang tight when the sledding is hard. Bring me an extra large supply while you are bringing, because, daily, I am forced to use it when called into conference with "other bidders were" who have been asked to prune here and pare there, cutting out their legitimate profit during the operation. I want the will to say "no," "nix," "not on your life," when jobs to be secured must be purchased outright.

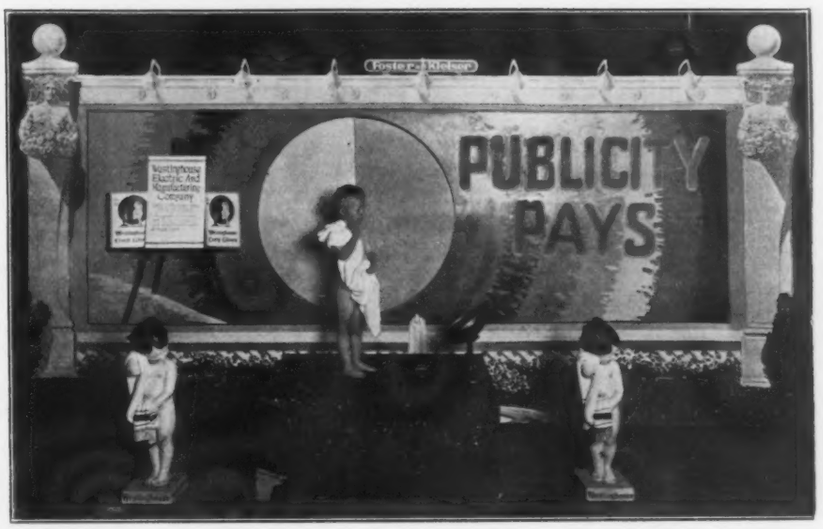
One more request, Kris, and I am through. Renew my battery of ambition—charge it to its utmost capacity—fill it to overflowing because, during the past year, it has run down until it will hardly turn me over.

Give me ambition to buy at the right time, sell at the right time, at a profit, and to continue the long march, onward and upward to the heights desired by all men of the industry.

These boons I ask in the name of the boys in the business who have carried the light thus far.

Yours fraternally, hopefully and electrically,

I. NEVERQUIT.



The Westinghouse Electric & Manufacturing Company took first prize at one of the Seattle Advertising Club's contests with this animated Cozy Glow heater advertisement. Twelve manufacturing, wholesale and retail firms competed in the contest. The part of the "Cozy Glow Kid" was taken by a 4-year-old boy.

In an unique float, portraying clothes washing methods from the beginning to the present time, the Idaho Power Company, Boise, Idaho, depicted the part played by electricity in the progress recorded in this most necessary housekeeping duty. The float appeared in the Pageant of Progress Parade, in Boise. The accompanying picture of the float shows that the three principal methods of washing clothes end with the method using the modern electric washing machine, and the banner attached tells the electrical story in a few words.

Electric Truck Goes to National Section Committee Meeting

A light electric delivery wagon was used by C. G. Scott, C. D. Monteith and R. C. Griffin, to go to San Rafael, Calif., to attend the Transportation Committee meeting. The trip was made by way of the Golden Gate Ferry, leaving at 9:30 a.m. The trip to San Rafael was made over the Corte Madera hill in good time, arriving at the Northwestern Pacific station at 10:55, which was five minutes ahead of the train which made connection with the boat leaving San Francisco at 9:45 a.m.

The round trip showed a total distance of 33.3 miles. The amount of current used was 72.5 amp. hours, or an input for charging 11.6 kw-hr. The cost per mile, assuming 2 cents per kw-hr., would therefore be 0.7 cent. Gasoline cost, assuming 15 mi. per gallon, would be 1.2 cents, or an increase of 71 per cent.

Maydwell & Hartzell, Inc., has been appointed sales agent in northern California and the Northwest for the Pacific Wire Rope Company, Los Angeles, Calif.

Putting Better Illumination in Colorado Kitchens

Public Service Company of Colorado Places 9,018 Kitchen Units, Thereby Greatly Increasing Operating Revenue

Nine thousand and eighteen kitchen lighting units were sold in thirty days.

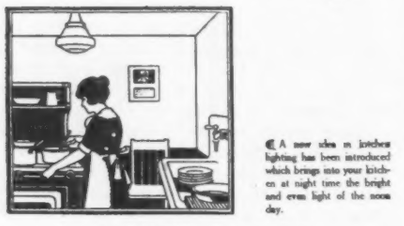
A saturation in various communities ranging from 47.5 per cent to 8 per cent was obtained.

In some towns more units were sold by general employees than by representatives of the commercial department.

Sales of 600 convenience outlets were made.

An immediate stimulation of interest in better home lighting, starting with the kitchen, was secured.

These are some of the outstanding features of the recent kitchen lighting unit campaign staged by the Public Service Company of Colorado in Denver as well as in northern Colorado towns and Cheyenne, Wyo. To the company it represents the sale of nearly $60,000 worth of electrical merchandise which it is estimated will return to the company an increase of over $80,000 in operating revenue during the next twelve months.


Is Your Kitchen Up-to-Date?
Is It Daylighted?
¶ A new idea in kitchen lighting has been introduced which brings into your kitchen at night time the bright and even light of the noon day.
The Daylight Kitchen Unit
¶ A kitchen fixture that throws soap shadows, enables you to work easily and pleasantly in any part of the room without straining your eyes. It has been called artificial daylight, because it has no glare—neither has it strong shadows to interfere with your work.
As a Special Introductory Offer
¶ We will install the Daylight Kitchen Unit in your kitchen on 30 Days' Free Trial. If you are satisfied with the light and want to keep it, you can buy it for only 50 cents a month—until you have paid $6.
¶ If you do not wish to keep it after the 30 days' free trial—we will remove the fixture at our expense.
¶ This same offer is effective not only in Denver, but also in—
Boulder Louisville Loveland Windsor
Lafayette Berthoud Fort Collins Cheyenne
Call Main 4000
Public Service Company
of Colorado

Four-column advertisements of this character called attention to the special offer.

According to Thomas F. Kennedy, general commercial manager of the Doherty companies, this campaign was the most successful ever staged by the commercial department of any of its subsidiaries, and the results obtained in the towns on the western division of the company establishes a new record, being the largest percentage of sales per domestic customer yet attained by any new business department of the company with kitchen units.

Holders for the units were manufactured in Denver according to specifications designed by Clarence Keeler, production manager and head of the fixture department. Three local fixture and spinning works produced the holders on schedule, and the glassware was not attached until the hanging of the unit in the home.

The holders were designed for the use of 150-watt daylight lamps, and included a reflector baffle-plate. They were finished in white enamel and were so designed that a canopy switch could be included when necessary. White enamel finish was used on the units.

In Denver and the larger cities of the western division the assistance of local contractors was employed in installing the units, while in the smaller towns the company made the installations with its own employees.

The units were sold, installed, for $6, payable at the rate of 50 cents a month with the light bill, and were installed on 30 days' free trial. No extra charge was made where a pull chain switch was required; in fact, when the commercial representative surveyed the prospect's kitchen, the type of holder required was noted, and the customer was not confused with talk about different type holders and switches.

Newspaper advertising was used in all the towns on the system. The initial advertising appeared in the Denver papers a week in advance of the opening, with a notation that the campaign was applicable to all the towns on the system. Broadsides were mailed to all customers according to a schedule which would insure their delivery to a customer not over a day or two in advance of a call by a representative.

Stickers with perforated return postal cards were also attached to the monthly service bill of each customer, and a splendid response was noted from this activity, according to George W. Bixler, publicity director of the company in Denver. A large number of customers asked for a trial installation of the unit through this medium before the representative had time to make a call on them.

Window displays were arranged at each sales office, the dominant feature being the contrast between a modern and improperly lighted kitchen. Flashers were employed in several cases to show the difference in the lighting.

Several "booster" meetings were held just prior to the opening of the campaign, one in Denver and the other at Fort Collins, the most centrally located point for the northern Colorado employees. At these meetings the general features of the campaign were outlined, announcements were made of campaign and special prizes, and individual sales quotas were established. A generous sprinkling of "pep" talks were made by company officials and representatives of the glass and lamp company whose products were used in the campaign.

There was not one of the employees at Fort Collins who did not sell at least one unit. Virgil Kinnison, in charge of arc lamps in that city, after regular working hours sold 218 units. A. B. Byron, a meter reader, sold 65, while W. I. Thomas, storekeeper of the company in that city, placed 54 units with customers of the company.

Among the commercial representatives, M. G. Wrigley of Boulder led the field with a total of 536 units, although H. W. Wood and V. H. Cable exceeded him in the percentage of sales to domestic customers. F. O. Ingraham of the Denver new business staff won first prize in that city with a total of 406 units. F. L. Farrow was second with 394, and George Hay was a close third with 393 units.

The executives under whose direct supervision the campaign was staged were: Denver division—R. G. Gentry, commercial manager, and John Miller, superintendent of the domestic electric division; western division—E. B. Ball, commercial manager, and G. C. Brierly, assistant commercial manager.

"Daylight"
your kitchen
The whole Family
Enjoys the kitchen-NOW!
THE bright, well-diffused light of this new Kitchen Unit lures the man of the house kitchenwards with his newspaper reading. Primarily, of course, the Kitchen Unit makes your kitchen a model of efficiency, enabling the housewife to see even into the depths of the oven.
SPECIAL OFFER!
Call Main 4000 and ask for a demonstrator to call upon you
Public Service Company
OF COLORADO

Men were also appealed to in the newspaper announcements of the campaign.

Interesting conclusions are derived from the comparative sales units in the various communities served by the company. Most striking is the fact that in the smaller towns a larger percentage of domestic customers was sold than in the bigger cities. Although 5,502 units were sold in Denver alone, this figure is about 8 per cent of the total customers, while in Lafayette, Colo., with a large population of foreigners and a poorer class of people, 47.5 per cent of the customers signed up for kitchen units. Figures on total sales made in the various offices of the western division of the company are shown in Table I.

Table I

Town	Number of Domestic Customers	Number of Units Sold	Percentage of Domestic Customers Sold
Lafayette	1,018	483	47.5
Fort Collins	2,532	1,141	45.1
Boulder	3,192	863	27.0
Loveland	1,613	384	23.8
Cheyenne	3,194	572	17.9
Windsor	472	72	16.3
Total	11,976	3,516	29.3

WINDOW displays used by the Public Service Company of Colorado to attract attention to the kitchen lighting campaign that was conducted recently. The displays shown at the upper left and right backed up each other at right angles and were used to illustrate bad and good light respectively. The general display shown in the lower picture was used to call attention to the unit that was being featured in the special 30-day campaign.

INDUSTRIAL NEWS

New Long Beach Steam Plant Is Put Into Service

Adding 35,000 kw. to the capacity of the Southern California Edison Company system, the first unit of the 70,000-kva. addition to the Long Beach steam plant went on the lines of that company at 7 a.m. Dec. 3.

The completion of this generating unit is the culminating point of the effort made this year by the Southern California Edison Company to provide ample power facilities to meet the rapidly increasing demands for service in the territory served. These demands were substantially augmented due to the dry season of the past year. A second unit of the same size is being installed and will be ready for operation in a few weeks.

According to G. C. Ward, vice-president of the company, these units are the largest and most efficient on the Pacific Coast. With the completion of the second unit, the original Long Beach steam plant and the new plant together will have a combined capacity of 148,750 kva. The plants will be consolidated to form the largest steam generating station west of the Mississippi River.

The completion of the Long Beach plant, together with the addition of 41,000 kva. to the Big Creek hydroelectric development now under construction, will bring the total generating capacity of the Southern California Edison Company up to 500,000 kva. of steam and water power.

Originally planned for completion in fourteen months, work on the Long Beach plant was rushed on an emergency schedule with the result that this first unit was brought into service eleven months after excavation was started. In doing this there was included a record-breaking transcontinental shipment consisting of twenty-two freight cars which made the trip from Schenectady, N. Y., to Long Beach in eight days.

Every modern device for efficiency and economy in steam generation has been used in the new plant. with the result that it will produce 350 kw-hr. per barrel of oil in comparison with 225 kw-hr. per barrel in the original Long Beach plant, which at the time of its construction received wide publicity for its great efficiency.

Great Western Exercises Option for San Joaquin Purchase

As foreshadowed in the Dec. 1, 1924, issue of the Journal of Electricity, the deal merging the Great Western Power Company of San Francisco and the San Joaquin Light & Power Corporation of Fresno was completed in New York Dec. 2 through the purchase of the majority of common and preferred stock in the latter utility by the Western Power Corporation of New Jersey, holding company for the San Francisco company. The purchase included the Midland Counties Public Service Corporation and the Fresno City Water Company, subsidiaries of the San Joaquin. The stock purchased was owned by W. G. Kerckhoff, president, and A. C. Balch, vice-president, of the San Joaquin, and their associates. The deal marks the retirement of this group from the hydroelectric field with which they have been associated since 1896.

Definite confirmation of the development program announced in the previous issue as hinging on the merger was contained in a statement by Guy C. Earl, president of the Great Western. This includes the construction of a 220-kv. tie-line between Sacramento and Fresno and the raising of Big Meadows dam at Lake Almanor 45 ft.

The extent of the combined systems of the two utilities is given in a statement issued by Mr. Earl which shows that 3,300 employees with an annual payroll of $5,000,000 will be required to operate the property. The transmission lines cover an area of approximately 50,000 sq. mi. in 24 counties having a population of nearly 2,225 000. Over 130 000 consumers with a connected load of 800,000 hp. are served by the two systems.

Rumors to the effect that some of the large Eastern holding companies are behind the merger have not been confirmed to date.

Los Angeles Gas and Electric Steam Plant Progressing.—Work on the new Seal Beach steam plant of the Los Angeles Gas & Electric Corporation is progressing rapidly, and practically all auxiliary machinery has arrived on the job. The generator also has been shipped from the Westinghouse Electric & Manufacturing Company factory and should soon be on the grounds. Two of the B. & W. 2 545-hp. boiler drums have been set in place, and the building has been housed in on all sides. Practically all orders have been let for the material necessary for the completion of the plant.

Change Made in Edison Organization.—E. R. Stauffacher, H. E. Barden, G. H. Whitney, C. H. Hagey and F. E. Chaffee, comprising the protection engineering department of the Southern California Edison Company, have been transferred to the operating department to carry on protection work. L. F. Hunt and L. P. DelSasso will remain with J. A. Lighthipe, chief electrical engineer, to carry on experimental and development work.

Cutler Site to Be Developed by Utah Utility Company

The application of the Utah Power & Light Company for 2,500 sec.-ft. and 75,000 acre-ft. storage from the unappropriated waters of the Bear River has been approved by the state engineer of Utah. This means that work will begin in the very near future on the construction of a hydroelectric power plant by that company on what is known as the Cutler site, on the Bear River, in Box Elder County, Utah. The plant will consist of two units, each with a capacity of 15,000 kw., making the total installed generating capacity 30,000 kw. When the plant is operating at capacity about 3,500 sec.-ft. of water will pass through the turbines under a head of 128 ft.

The dam will be located a short distance above the plant. It will be of cement concrete construction, of the combination gravity and arch type. The crest of the dam will have a maximum height of 110 ft. above bedrock. The length of the dam over all will be about 500 ft.

This new plant will be the largest hydroelectric plant in the State of Utah, and will be second in size on the company's system to the Grace, Idaho, plant on the Bear River, of 44,000-kw. installed capacity.

The construction program in the building of this plant and dam involves an expenditure of about $5,500,000 and the employment of approximately 1,000 men for a period of two years. It is expected that actual construction work will be under way by March 1, 1925.

American Power & Light Company Acquires Arizona Utility

Control of the Central Arizona Light & Power Company, Phoenix, Ariz., serving that city and adjacent territory, has been acquired by the American Power & Light Company, New York. The latter company has recently bought additional properties in Florida and extended its interests in Minnesota and Texas through the acquisition of other properties by the Minnesota Utilities Company, the Texas Power & Light Company and the Texas Public Utilities Company.

Through its subsidiaries, the American Power & Light Company now serves about 440 communities in Oregon, Washington, Idaho, Arizona, Texas, Kansas, Nebraska, Iowa, Minnesota, Wisconsin and Florida. Among the larger cities served by the operating companies are Portland, Ore., Walla Walla, Wash., Lewiston, Idaho, Phoenix, Ariz., Fort Worth, El Paso, Galveston and Waco, Texas.

Pit No. 3 Bore Holed Through and Ready for Lining

Completion of the bore of the 20,981-ft. tunnel at the Pit No. 3 development of the Pacific Gas and Electric Company marks an important step in this project. The tunnel was started in August, 1923, and comprises a passageway of approximately 23-ft. diameter in the rough, and will be 19 ft. in diameter when completed with its lining of concrete. Two adits sunk in at convenient points provided a total of six working headings, at which 250 men were kept busy, working in 8-hour shifts. Three compressed air shovels of special design were used in this work. A dam 125 ft. high and 400 ft. long will divert the waters of the Pit River through this aqueduct and five miles down the canyon to the power plant, where a head of approximately 450 feet will be realized. To date no concrete has been placed in the tunnel, but crews will be kept busy all winter placing this lining. The plant itself is about 50 per cent complete, and the entire job is expected to be completed during July, 1925.

The time and cost of the job to date is running well under estimates prepared before the work was started. The cost of the work up to Sept. 25 was $1,038,000, while the estimated total cost of the completed tunnel is $3,500,000.

Baker River Line Construction Partly Completed

Recent completion by Stone & Webster, Inc., of the 110,000-volt transmission line from Everett to Sedro-Wooley, Wash., a distance of about 45 mi., marks a step in the completion of the Baker River development of the Puget Sound Power & Light Company, Seattle, Wash. The line has been put into service temporarily at 60,000 volts, to improve conditions in the district, and work on the 25-mile section of 60,000-volt line from Sedro-Wooley north to Bellingham has been started. W. D. Shannon, general superintendent of Stone & Webster, Inc., Seattle, is in charge of the work.

These two lines, radiating from the new Sedro-Wooley substation, will be connected to the Baker River plant near Concrete, by a 110,000-volt line to be built next year.

Utility Information Committee Forms Plans for 1925

The public service institutions of Colorado, New Mexico and Wyoming on the first of December launched plans through which they intend to double the production of public good will in the territory served by them. Operating chiefly through the Rocky Mountain Committee on Public Utility Information, utilities in the Mountain states expect to obtain twice as big results as they did in 1924, which was the most successful year since systematic public good will building efforts were started three years ago.

At the annual meeting and election of the Rocky Mountain committee held in Denver, Colo., Dec. 1, W. C. Sterne was re-elected chairman, for the third successive year. Mr. Sterne is the head of a number of electric utilities operating in towns near Denver and in various mining districts. His re-election was in recognition of the remarkable manner in which he has held together the large membership of the Rocky Mountain committee, which includes the more progressive electric, street railway, gas and telephone executives of the three states within its jurisdiction.

V. L. Board, general superintendent of the Public Service Company of Colorado, was re-elected secretary-treasurer of the committee for the third successive time, while R. M. Morris, general commercial manager of the Mountain States Telephone & Telegraph Company, Denver, was re-elected vice-chairman for the second time.

The Rocky Mountain committee has met with signal success in the prosecution of its activities in the universities, colleges, high and grade schools. Every university and college in Colorado, without an exception, is regularly taking from three to twelve utility subjects, the talks being made by committee members. Regular lectures are also being given in the high schools, more than sixty such talks having been presented during the past year.

Recently, faculty members from every university and college in Colorado met with members of the committee at a joint conference in Denver, at which the work for the winter terms was outlined. It is planned to extend the committee's activities to the universities and colleges in New Mexico and Wyoming during the winter.

The Rocky Mountain committee also is conducting classes in public speaking. Employees of the Denver utilities meet once a week, and a critic and expert in public speaking is in charge. From 10 to 50 embryo public speakers attend each session.

Newspaper advertising is playing an important part in winning public good will and understanding of utility problems in Colorado, New Mexico and Wyoming. Thousands of inches of display advertising are used. It is understood that a higher percentage of the utilities in this region is making use of newspaper advertising than in any other part of the country.

On Dec. 18 there will be a joint conference of utility men in Denver. Various questions of vital interest to the utility industry as a whole will be discussed and plans perfected for greater cooperation with the Rocky Mountain committee.

110,000-Volt Underground Cable Subjected to Tests

Supplementing laboratory and factory tests on high-voltage cable, a field test on a commercial length operating at 110,000 volts is being made by the General Electric Company. For this field test a 200-ft. length of single conductor cable is connected to the system of the Adirondack Power & Light Corporation at its North Albany station, Albany, N. Y.

The cable is connected through a separate oil switch outside of the lightning arresters, and is therefore subject to all of the surges, overvoltage stresses, etc., which might occur in the system proper. The length has been under test for more than five weeks and no trouble has developed.

This is the highest voltage at which a lead-sheathed cable has been operated in this country. The nearest approach is the 66,000-volt cable used by the Cleveland Electric Illuminating Company.

Basins of Columbia and Salt Lake Basis of Water Report

The United States Geological Survey has issued Water-Supply Paper 514, "Surface Water Supply of Lower Columbia River and Pacific Slope Drainage Basins in Oregon, 1919-1920." This is Part XII, and is one of a series of fourteen reports presenting results of measurements of flow made on streams in the United States during the years ended Sept. 30, 1919 and 1920, and was prepared in cooperation with the States of Oregon and Washington. The book contains numerous tables showing the daily discharge and monthly discharge and run-off of the Columbia River and its tributaries and of the streams between the Columbia River and the Klamath River. It is fully indexed.

The Geological Survey has also issued Water-Supply Paper 517, "Water Powers of the Great Salt Lake Basin," by Ralf R. Woolley, with an introduction by Nathan C. Grover. It covers in detail geography, geology and physiography of the Great Salt Lake Basin; climate; lake levels; general features of the various river basins; stream flow; reservoirs and reservoir sites; developed and undeveloped water power; water rights and appropriations; irrigation; market conditions; relation of the federal government to the development of water power. A map of the eastern portion of the Great Salt Lake Basin showing the development of water power is carried as a supplement.

Paper 514 may be procured for 25 cents and 517 for 30 cents from the Superintendent of Documents, Government Printing Office, Washington, D. C.

New Unit Installed in Montana Hydroelectric Plant

The Mountain States Power Company has installed a new hydroelectric unit in its plant at Big Fork, Mont. The new unit is an S. Morgan Smith vertical-tube waterwheel direct-connected to an Allis-Chalmers 2,300-volt, 60-cycle, 3-phase, 1,750-kw. generator. Moloney transformers to step the voltage up to 33,000 volts have been installed in the plant.

Prior to the bringing in of the new unit, the plant, located on the Big Fork River, contained two units, one of 500 kw. and the other of 750 kw. capacity. This plant serves the Kalispell, Mont., district of the Mountain States Power Company.

Great Western Announces Scope of 1924 Extensions. — Routine extensions and installations made by the Great Western Power Company during 1924 have cost that company nearly $1,500,000, according to J. B. Black, vice-president and general manager of the company. The more important items included in the year's work are: The building of 4½ miles of 4-kv. lines to care for pumping and lighting load in District 307, near Lisbon; the rebuilding of the Napa substation to care for increased street lighting; the completion of a new line to the works of the Henry Dalton Company of Oakland to serve a new 1,000-kva. metal-heating furnace being installed at that plant. Line extensions and substation additions are also planned for several districts adjacent to Sacramento.

Early Returns Indicate Success for Lighting Contest

Early returns from ten city headquarters in the Western states indicate that an average of 11.17 per cent of the school children in those cities that registered in the Better Home Lighting Contest, which was recently brought to a close, submitted essays. In these cities, picked to give a representative cross section of the Western states, 39 218 children registered in the contest, and 4,375 sent in answers. A total of 49,438 primers was distributed by various agencies—schools, banks, central station companies, electrical contractor-dealers—in order that the children might participate in the contest.

Approximate figures from four states show that over 14,000 essays were entered in the contest. Over 100,000 primers were distributed in these four states, 70,000 being distributed in California alone. The children sending in essays were 21.21 per cent of the total registration.

Figures from two county districts in California indicate that, due to the difficulty of reaching the students, the ratio between answers and eligibles is considerably lower than it is in the cities, the average being over 2 per cent. The proportion of essays to registrants averages 9.31 per cent. The average ratio between essays and registrants for the three groups is 16.85 per cent.

The results shown in the accompanying table do not give a complete history of the Better Home Lighting Contest. The figures, despite the fact that they are as accurate as can be secured at this date, do not cover the contest completely. Many small communities have not reported, and several chairmen in several of the larger cities have not been able to make reports on the outcome of the campaigns. The registration figures that have been compiled do not give the actual total of those enrolled in the contest, due to the fact that in some communities, particularly in California, where 70,000 primers were placed in the children's hands, the contestants withheld their enrollment registration cards until the time that the primers and essays were submitted. This, of course, has lowered the number of registrants, as in most cases late registration cards have not been counted yet, and has raised the ratio between answers and registrants. A similar discrepancy may be noted in the number of essays received. In some localities the school authorities graded the primers and essays before submitting them to the local contest committees and in this way eliminated many that did not comply with all requirements of the contest. District chairmen believe that in some localities fully 50 per cent of the total number of answers submitted to the school authorities were thus rejected by the school heads. This, of course, saved time for the local judges, but reduced the total number of essays submitted.

In general, reports from those in charge of the Better Home Lighting Contest in the Western states indicate that the results have been highly satisfactory and that a great amount of educational work has been accomplished. By the participation of the school children in the contest, the attention of thousands has been drawn to the need for better lighting in the home.

Location State	No. of registrants	No. of essays received	Primers sent out	Percentage of essays to eligibles	Percentage of essays to registrants
California	36,000[8]	4,500[6]	70,000[6]		12.5[9]
Colorado, New Mexico and Wyoming	32,000	9,928	35,000	19[6]	31[6]
Total	68,000	14,428	105,000		
Average					21.21[6]
Cities					
Los Angeles, Calif.[1]	14,000[6]	581[7]	14,500	2.1	4
Salt Lake City, Utah[2]	10,000[6]	4,000[6]	15,000[6]	15	40
Oakland, Calif.[1]	2,200[8]	1,060[7]	5,500	8.8	50[10]
Portland, Ore.[2]	10,200	1,368	11,620	4.7	13.4
Spokane, Wash.[3]	400	119	300	1	30
San Diego, Calif.[1]	300	33	400	4	11
Yakima, Wash.[4]	1,100	485	1,100	21.2	44
Medford, Ore.[5]	1,018	329	1,018	13.4	32.4
Total	39,218	4,375	49,438		
Average					11.17
Counties					
Los Angeles County	9,100[6]	700	9,000	2.8	7.7
Sacramento, Solano and Yolo Counties, Calif.	690[6][8]	221	2,000	1.5	32
Total	9,790	921	11,000		
Average					9.31

[1]Covers one city only.
[2]Covers 35 cities.
[3]Covers 15 cities.
[4]Covers 26 cities.
[5]Covers 10 cities.
[6]Approximate figure.
[7]Many essays that were read by the school authorities were not turned in to the contest judges.
[8]Due to a misunderstanding of the rules, a large number of children did not send in registration cards prior to the time they submitted their essays. This accounts for the low registration.
[9]Due to the fact that in California many registration cards were submitted with the essays and have not been counted yet, this percentage is high. A more accurate figure would be one showing that 6.43 per cent of the 70,000 children receiving primers sent in answers.
[10]Although 50 per cent of the registered contestants submitted essays, due to low registration as explained in [8], completed work was received from 18.5 per cent of those who were given primers.

Pacific Gas and Electric Company Applies for Revision of Resale Power Rates.—The Pacific Gas and Electric Company has applied to the California Railroad Commission for a revision of its schedule of rates for the sale of power for resale purposes. The company has stated that it has a deficit for the year 1924 in its operations under this particular schedule amounting to $400,000.

$5,000,000 Valmont Steam Plant Placed in Operation

Completion of the first unit of the new Valmont steam plant of the Public Service Company of Colorado enabled the starting of this plant Nov. 30. This station is located about three miles east of Boulder, Colo., and is designed for an ultimate installation of five 20,000-kw. generators, only one of which is in service at the present time. The others will be added as needed.

The unit now in service is a 20 000-kw., 1,800-r.p.m., 13,000-volt Westinghouse generator direct connected to a 33,500-hp. impulse reaction Westinghouse turbine. Steam is supplied by a battery of four Bigelow-Hornsby 1,300-hp. boilers operating at 375-lb. pressure, 200 deg. superheat, and fired with pulverized fuel. A 110-ft. dam impounds the spring flood waters of South Boulder Creek, forming a reservoir of 9,792.86 acre-ft. capacity and 419.24 acres area for condenser cooling water.

A 24-mile, 110-kv. transmission line to Lacombe station in Denver forms the main artery from the plant, while an 8-mile, 110-kv. tie line to the Boulder Canyon hydro plant and a 44-kv. loop tie line to the Lafayette power house complete the tie-in of the new with the old. Brought to completion at the same time as the steam plant, the new Lacombe receiving station brings together for distribution the power generated both there and at the Boulder Canyon hydro plant. The capacity of this distributing center is 22.500 kw. at present and 90,000 kw. ultimate.

P.C.E.A. Technical Section to Hold Conclave Meeting

The first 1925 conclave meeting of the Technical Section of the P.C.E.A. will be held at the Hotel Fairmont, San Francisco, Jan. 7-9. All bureaus of the section will meet at this time.

The meetings of the bureaus will be held during the three days. Several of the bureaus have meetings scheduled for more than one day. The meeting of the executive committee will be held at 4 p.m. on Jan. 9. The general meeting will convene at 8 p.m. on Jan. 8.

The schedule of the bureau meetings is as follows:

	Wed. Jan. 7	Thurs. Jan. 8	Fri. Jan. 9
Hydraulic Power Bureau	10 am		
Underground Systems Bureau	10 am		
Meter Bureau	10 am	10 am	
Accident Prevention Bureau	10 am	10 am	
Overhead Systems Bureau	10 am	10 am	10 am
Apparatus Bureau		10 am	
Inductive Co-ordination Bureau			10 am
Prime Movers Bureau			10 am
Safety Rules Bureau			10 am
Executive Meeting			4 pm
General Meeting		8 pm	

Water Company May Develop Power From Siphon.—Utilization of a 200-ft. head in the new 32-in. siphon it has just completed, for hydroelectric generation, is contemplated by the Escondido Mutual Water Company. The company already has two small hydroelectric plants, one at Rincon, the other at Bear Valley, from which it derives power which it distributes to territory in the vicinity of Escondido, Calif. The new siphon cuts off three miles of canal between Lake Henshaw and Lake Wohlford. It is situated in Hell Hole Canyon, a few miles from Escondido.

Report on Skagit Cost Is Issued; Total Is $13,089,766

According to figures recently made public by H. W. Carroll, chief accountant of the office of the city comptroller, Seattle, Wash., that city has expended or designated for expenditure, on the Skagit hydroelectric development, $13,089,766. The figures show that for actual construction there has been spent $11,131,896, or $131,896 more than was expected when the $11,000,000 bond issue was authorized to pay for the Gorge Creek unit. Other items, bringing the total past the $13,000,000 mark, were charges by the City Light Department for bond interest and discount amortization to the sum of $1,957,870, and certain pieces of construction transferred from that department.

The report calls attention to several items of cost, charged to the Gorge Creek construction, that will be retained and will prove useful in any future development. The largest of such items is the $1,750,000 railway from Rockport to the Skagit Camp. Another is the right of way for the transmission line, costing about $500,000. Camp supplies and equipment of a value of about $100,000 will also be retained by the City Light Department.

Sale of Municipal Hydro Bonds Prohibited by Court

The city of Aberdeen, Wash., will not be allowed to proceed with the sale of its $2,000,000 bond issue voted on Dec. 1, 1923, for the construction of a municipal hydroelectric plant on the Wynooche River in Grays Harbor County and for the financing of improvements to its water system, according to a recent Supreme Court decision. The ruling upheld the Grays Harbor County Court, which had declared the election void because it involved the financing of two projects from one bond issue.

The city proposed to construct a dam on the Wynooche River which would create what was to be known as the Weatherwax Basin. Water was to have been used from this basin for the operation of a hydroelectric plant and some of the water was to have been transferred to augment the flow of the Wishkah River, from which the city derives its municipal supply.

Action to enjoin the city from proceeding with the sale of the bonds was brought in the name of F. O. Dole, a citizen and taxpayer. He was successful in the low court and also in the Supreme Court. No information is available as to what course the city will now pursue.

Changes in Denver Regulations to Take Effect Jan. 1

New regulations by the electrical inspection department of the city of Denver, Colo., to be put in effect Jan. 1, 1925, are regarded by observers as of unusual interest. This interest is due to the fact that the changes are considered by many as the logical improvement of electrical installations in a city where the all-metal requirements have been in force for years.

The changes announced by C. F. Oehmler, head of the inspection department, concern the exclusive use of galvanized conduit, fittings and equipment, and it is understood that this regulation will apply to coverings of ordinary motor-starting devices. An exception will be made in the case of motor housings or in other cases where separate grounds and clean connections are provided in the discretion of the inspectors.

Galvanized cabinets will also be required, and in all cases of concealed work flush type cabinets will be required. Safety type externally operated knife switches of all types will hereafter be required except in the case of those switches which are integral parts of switchboards. This regulation will apply to all classes of work, including distributing cabinets and switches in residences.

Mr. Oehmler has expressed himself in favor of the Red Seal standard of wiring which is being promoted throughout the country and has given his assurance to officials of the Electrical Cooperative League of Denver that he will lend his assistance in establishing the standard in Denver.

Coupeville, Wash., to Receive Better Service.—The Whidby Light & Power Company, Olympia, Wash., plans to supply the town of Coupeville, Wash., with light and power, if the rate and regulation schedules filed with the Washington Department of Public Works are accepted. The company will charge a rate of 20 cents per kw-hr. for all service except street lighting.

Preliminary Permit Granted for Elwha River Power Site

The Federal Power Commission has issued a preliminary permit to the Northwestern Power & Manufacturing Company of Port Angeles, Wash., for the construction of a power dam and hydroelectric plant on the Upper Elwha River, within the Olympic National Forest, according to advices received by R. L. Fromme, supervisor of the forest.

The plan of the company is to develop about 7,000 hp. at the Upper Elwha plant and then carry the water down the river in a concrete conduit a distance of about four miles to where it has another generating plant. The permit calls for the appropriation of 460 sec.-ft. of water. A considerable portion of energy developed at present is used in Bremerton, Wash., and vicinity.

Municipal Plant Taken Over by Oregon Company.—As a result of a special election at Scio, Ore., passing on the sale of its municipal plant and distributing system to the Mountain States Power Company, Albany, Ore., the city turned over these properties to the power company on Nov. 1, 1924. By a vote of 124 to 3, the electorate favored the sale at the agreed price of $42,500 in cash plus certain street lighting concessions.

Ye Bidding to Ye Christmas feaste of Victual and of Soul

Ye feaste and faste throughout ye yeare,
Of whatsoever merit,
Mean little to ye Engyneere
Who hath noe time to spare it.

But when ye cheer of Xmas Day
Is burgeoned through ye lande,
Ye Engyneeres become a gay,
Albeit pious, bande.

They'll gather at ye meetynge guild,
Fulle copiously eatynge;
And then, content, with bellye filled,
Exchange theyre Xmas greetyng.

Ye robed choir will chant ye layes,
Ye fiddler whine ye tune,
And what ye gifted speaker sayes
Is lost in quiet swoone.

So come eache goodlye Engyneere;
Lay by yon slide-rule worne,
And marke with fellowship sincere
Ye daye The Childe was born.

Saturday, December 20, 1924
Luncheon at 1:00 p.m.

LOWELL REDFIELD'S CHOIRSTERS
RUDY SEIGER'S ORCHESTRA
A DISTINGUISHED SPEAKER

Engineers' Club
San Francisco

Card sent out by the Engineers' Club of San Francisco, inviting members to attend a Christmas luncheon to be held at the club Dec. 20.

Hetch Hetchy Mountain Division Work Temporarily Halted

Work was stopped in several mountain camps on the Hetch Hetchy water supply project of the city of San Francisco, Calif., on Dec. 8, and 500 men were laid off, as a result of the recent controversy over construction, referred to in Journal of Electricity, Dec. 1, 1924, p. 416. The two principal operations discontinued were all tunnel lining and the construction of the South Fork aqueduct crossing. The stop order issued by the acting mayor was nullified by an injunction secured by a taxpayer, as previously stated, and the court later ruled that the order was not binding upon the Board of Public Works. The latter body, however, had already passed a resolution pursuant to the acting mayor's order, and upon the auditor's showing that money remaining in the 1910 bond issue fund was insufficient for further work the resolution was allowed to stand even though it halted work considered highly important.

One result of the dispute has been the action taken by the Board of Supervisors in modifying the 1913 ordinance which gave the Board of Public Works, and through that body the city engineer, authority to let contracts, purchase supplies and, in general, to operate without restriction in carrying on the work. Under the modified ordinance the Board of Public Works must itemize its budget and get the approval of the supervisors in advance. Expenditures in excess of the budget may be made only by special authorization.

The supervisors have been endeavoring to find some financial plan whereby the fund, from which money for Hetch Hetchy construction must be drawn, can be supplied with the amount necessary to complete the work in the mountain division. The City attorney has stated that the charter prohibits borrowing money direct from the banks. Of several plans suggested, one proposed that the Spring Valley Water Company of San Francisco, which is to pay the city $250,000 annually as interest on the construction cost of the bay crossing as long as this shall be used to bring in water from the Calaveras watershed, be asked to make an advance payment of four years' interest. As this issue goes to press, it is reported that the water company has agreed to the proposition, and work on the mountain division is expected to be resumed within a few days.

Edison Company to Hold Kitchen Unit Sales Campaign

A kitchen lighting unit sales campaign to cover the entire system of the Southern California Edison Company is scheduled to start Jan. 1, 1925. Preliminary to the announcement of the campaign to cover the entire system, the Edison company conducted a trial campaign in its Vernon, Calif., district.

In this territory, during a two weeks' campaign that was closed Dec. 1, a total of 580 units was sold. Average lamp sizes were increased 40 watts as a result of the installation of the units. The territory in which the trial campaign was conducted included the cities of Vernon, Huntington Park, Cudahy, Bell, Maywood and adjacent territory and has an approximate population of 100,000 with a total of 20,000 consumers on the Edison company lines.

In the Vernon district campaign, it was found that salesmen found 25 per cent of the people not at home. Ten per cent of those interviewed purchased the kitchen lighting units. The salesmen were well received, and indications are that better lighted kitchens will result in more light being used in other parts of the home.

The offer made by the company included the installation of the kitchen lighting unit without charge for a 15-day trial period. At the end of that time if the purchaser was not entirely satisfied with the unit, it was removed and the old fixture replaced. If the unit was kept the customer received a bill for 75 cents with the first lighting bill subsequent to installation and a bill for the same amount with each succeeding lighting bill until the total amount of $6.75 was paid. Arrangements were made with local contractor-dealers to install the units as soon after the sale as possible.

The same general campaign plans will be used in the sales drive that will start the first of the year.

California Water and Power Act Cost Was $145,668.41

The California Water and Power Act, defeated at the last election, cost proponents and opponents $145,668.41, according to the expenditures reported to F. C. Jordan, secretary of state. Of this sum the opponents spent $103,656.41 and the proponents reported spending $42,012. It is reported that Rudolph Spreckels, one of the chief proponents, contributed about $27,000 of the money spent to encourage passage of the act.

The itemized expenditures of the power companies are reported as follows: Southern California Edison Company, $39,188.93; Pacific Gas and Electric Company, $46,285.87; San Joaquin Light & Power Corporation, $6.380.88; San Diego Consolidated Gas & Electric Company, $5,464.08; Western States Gas & Electric Company, $2,182.43; Southern Sierras Power Company, $1,595.76; Midland Counties Public Service Corporation, $1,306.12; Great Western Power Company, $1,252.34.

Court Grants Loveland Right to Operate Municipal Plant

The right of the city of Loveland, Colo., to operate its recently constructed municipal light and power plant has been affirmed by the United States Court of Appeals. The decision sanctions that of the United States District Court which denied the appeal of the Franklin Trust Company of New York, bondholders of the Public Service Company of Colorado, to restrain the city from condemning the distributing system of the latter company.

The bondholding company claimed that its holdings would be impaired if the city were allowed the right to condemn the distributing system of the Public Service Company of Colorado. The utility company has been serving the city for some time, and its franchise has two years to run.

The municipal plant has just been completed at a cost of $500,000. It has been announced that the plant will be put in operation Jan. 1, 1925.

N.E.L.A. Educational Courses Are Ready for Distribution

The National Electric Light Association has recently published a series of three educational courses in booklet form that are remarkable for the clearness with which the subjects are presented. The courses have been compiled and published under the direction of the Committee on Education of the Commercial Section and cover three subjects of special interest to central station employees. The courses presented are:

1—Lighting sales course.
2—Merchandise sales course.
3—Power sales course.

The student is first given the basic principles of central station work in a series of six lessons covering Part I of the course. Lesson 1 is Salesmanship, followed by (2) Public Relations, (3) Elements of Electricity, (4) Rates, and (5) Wiring for Light and Power.

Part II consists of a series of lessons dealing with the specific course being studied. Part II of the Lighting Sales Course is presented in seven lessons, each dealing with a separate phase of the application of light. Primarily, however, the student is given a discussion on the fundamentals, covering light sources, then measurements and elementary calculation. The remainder of the lessons covers successively Residence Lighting, Store Lighting, Office Lighting and Industrial Lighting and Outdoor Applications. The subjects are all covered in a complete and concise manner.

The committee deserves the utmost praise for the manner in which it has selected and edited this course. Although much of the material is reprint of manufacturers' data books and is not new, it is so arranged as to be continuous and complete. This course should prove of inestimable value to all those who desire to grasp the essentials of the subject.

Part II of the Merchandise Sales Course deals with Advertising, Merchandising, Electric Heating, Industrial Appliances and Selling Campaigns. The subjects are treated in a comprehensive way and the material should be helpful to every sales employee.

Part II of the Power Sales Course deals with Electric Motors, Motor Applications, Steam, Gas and Oil Engines and Industrial Heating. Illustrations, diagrams and curves add to the value of this course and make the various sections extremely valuable to all students and others interested in power sales.

The courses are obtainable on payment of the registration fees as follows: Merchandising Sales Course, $12; Power Sales Course, $6; Lighting Sales Course, $6. All of the courses have been prepared under the direction of Fred R. Jenkins, chairman, Committee on Education, National Electric Light Association, 72 West Adams St., Chicago, Ill., to whom all inquiries should be directed.

Salt Lake City Contractor-Dealers Form New Organization.—The organization of contractor-dealers in Salt Lake City, Utah, which was formerly known as the Utah Association of Electragists, has been reorganized and is now known as the Salt Lake Electrical Contractors' and Dealers' Association. New officers

H. B. Kirkland Is to Supervise Red Seal Plan Campaign

H. B. Kirkland, vice-president of the American Wiremold Company and president of the Electrical League of Hartford, Conn., will join the headquarters staff of the Society for Electrical Development, Dec. 1. He will supervise the society's general activities affecting wiring and particularly "The Red Seal Plan to promote adequate wiring for convenient electrical service in the home."

Mr. Kirkland will co-ordinate the recommendations of the Red Seal advisory

H. B. KIRKLAND

committees, appointed by the various national associations, and will be available to assist national organizations in the development of other cooperative programs for the advancement of wiring standards.

His wide acquaintanceship will strengthen the society's intimate contacts throughout the industry and will further insure the proper consideration of the many diverse interests in cooperative work. On account of his long experience in the industry and his constructive work in the wiring field, he is admirably fitted to handle the national organization of the Red Seal campaign.

Additions Made to Los Angeles Distribution System

Construction of a new substation on Mateo Street in Los Angeles, Calif., has been started by the Los Angeles Bureau of Power and Light. The initial capacity of the substation is to be 10,000 kva. The station is being planned for an ultimate capacity of 50,000 kva. This substation will be built along standard designs which provide for the 33-kv. switching equipment on the upper floor, while the 4.4-kv. switches, regulators and feeders occupy the main floor. The building is of the T shape, unit type, and is well adapted for expansions to accommodate the growth of business.

Substations of a similar design have been completed within the last eight or nine months at Ninth and Figueroa Streets and at San Pedro. A synchronous condenser is installed in the San Pedro building and a motor-generator set is included in the Ninth and Figueroa equipment. All of these substations are fed from the city's 33-kv. lines over two or more lines from different points.

A 33-kv. loop and feeder circuit some 40 miles long has been completed in the San Fernando Valley district to feed various industries located there. A large part of the city's distribution system, including about half of the Hollywood district, has been cut over to 4.4-kv. operation and the remainder is expected to be completed by February, 1925. A new substation site has just been purchased at Thirtieth and San Pedro Streets.

Ogden Chapter of A.A.E. Resumes Weekly Meetings.—The weekly luncheons of the Ogden, Utah, Chapter of the American Association of Engineers, which were discontinued last spring, have been resumed.

Books and Bulletins

THEORY AND PRACTICE OF PUBLIC UTILITY VALUATION

By W. H. Maltbie. 201 pages. $2. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

According to the author, who is a consultant on public utility valuation, rates and taxation, this book is intended to be a discussion of the principal points in the theory and practice of public utility valuation. The material is presented in such a way as to make it intelligible to the general public, and it is not intended that the book shall be a reference work for the valuation specialist. It represents the conclusions of an individual student of the subject, and in general no attempt is made to support the statements in the book with reference to recorded decisions.

The introduction outlines the relation of a corporation to the public service commission. The author's clarity of expression throughout the book is well illustrated by the following definitions used in discussing the fundamental principles of constructive regulation. He states:

1. "It is the duty of the commission to protect the consumer—to see that he is not charged an excessive price for the article which he buys or the service which is rendered him."

2. "It is the duty of the commission to protect the investor—to see that what he has devoted to the public service is not taken from him and that he is allowed to receive therefrom an adequate return."

The introduction is followed by chapters on Original Cost, Capitalization, and Market Values of Securities Outstanding, followed by five chapters devoted to the important subject of Cost to Reproduce New. Then follow chapters on Overhead Charges, and Working Capital, Intangible Values and Deductions from Gross Value. The important subject of Depreciation is allotted five chapters, and the book concludes with chapters on Present Value and The Rate of Return.

Throughout the book one can see that the author has exercised care in the presentation of each branch of the subject, using some concrete illustration wherever possible. As a result, a complicated subject involving business, legal and engineering principles is presented in such a manner that the book is suitable for use as supplementary reading by engineering students as well as by those following the diversified interests of public utilities.

E. R. S.

ENGINEERING IN AMERICAN INDUSTRY

A reprint of a lecture delivered by Conrad Newton Lauer before Princeton University under the Cyrus Fogg Brackett Lectureship in Applied Engineering Technology. 94 pages; numerous illustrations. $2.50. Published by McGraw-Hill Book Company, Inc., New York, N. Y.

This is "a review of the growth and development of manufacture in the United States and the contributions which engineering has made." Mr. Lauer starts with the year 1803, choosing that year "because the 120 years that have elapsed since then are less than the span of two biblical lifetimes of threescore years and ten. In other words, the time element in American development has been within an almost incredibly short period." He uses as an example a typical Virginia farmer in need of a plow and the difficulties and hardships attendant upon his acquiring it, such as undeveloped industrial progress, high cost of commodity, a primitive and ineffective product, lack of transportation, waste of time and lack of communication. Abstracts from three newspapers published in Richmond, Va., in December, 1803, give a resume of industrial conditions at that time. Mr. Lauer touches upon the invention of the steamboat, the telegraph and telephone and on the power situation, and draws attention to the contribution of civil, mechanical and electrical engineering to transportation, of mechanical and electrical engineering to power supply, and of engineering in general to communications.

Then follows a series of graphical maps to show the progressive development of American industry by states and by decades, commencing with 1849, together with brief historical data of each period. The book contains a large number of charts showing population centers, manufacturing centers, production output of American industries, production of various commodities, rubber imports, motor vehicle registration, railroad mileage, freight traffic, statistics on the power industry, gross revenue of the Post Office Department, U. S. exports and imports, and the growth of American collegiate education.

Comparison is made between the conditions surrounding the farmer of 1803 and those surrounding his grandson who, in 1923, wants a tractor plow. Engineering is found to have contributed, in general and among other ways, in the development and application of the physical mechanism of industry; in industrial administration; in distribution and marketing; in the economics and finance of industry; in the development of the industrial enterprise.

The illustrations are one of the most interesting features of the book, particularly the reproductions of old woodcuts such as the first locomotive and train of passenger cars ever run in the State of New York, the Philadelphia Water Works engine of 1800, a telephone exchange of 1879, quadruplex telegraphy in 1884, and electric traction in 1880.

E. J.

Meetings

Rocky Mountain Service Groups Are to Meet Dec. 18

The annual midwinter meeting, sponsored jointly by the Colorado Public Service Association and the Rocky Mountain division of the N.E.L.A., will be held at the Denver Athletic Club, Denver, Colo., Dec. 18, according to a report just received from O. A. Weller, secretary of both bodies. Attendance last year passed the hundred mark and proved so successful that arrangements are being made to care for even a larger gathering this year. Representatives from the utility companies in the states of Colorado, Wyoming and New Mexico will attend. A large number of department heads from the service companies in Denver also will be in attendance.

Entertainment has been provided by these companies and will take the form of a luncheon at noon, with Ernest Stenger, receiver of the Denver Tramway Company, as host; dinner at night with the Mountain States Telephone & Telegraph Company in its cafeteria, to be followed by a theater party arranged by Clare N. Stannard, vice-president and general manager of the Public Service Company of Colorado.

One of the features of the program will be the appearance of several representative high school boys to present the opinion of the younger generation on the service of the various utilities.

Committees appointed for the meeting are: General committee—W. P. Southard, chairman; C. A. Semrad and W. C. Sterne; program committee—J. E. Loiseau, chairman; R. B. Bonney, E. A. West, G. E. Lewis and O. A. Weller; arrangements committee — S. W. Bishop, chairman; A. C. Cornell, B. C. Wheatland and H. S. Sands.

COMING EVENTS

Colorado Public Service Association—
Annual Midwinter Meeting—Denver, Colo.
Dec. 18, 1924

Rocky Mountain Division, National Electric Light Association—
Annual Midwinter Meeting—Denver, Colo.
Dec. 18, 1924

New Mexico Electrical Association—
Annual Convention—Albuquerque, N. M.
Feb. 16-18, 1925

San Diego County Possibilities Are Explained at Club

Farming and industrial possibilities of San Diego, Calif., were surveyed by members of the Electric Club of that city when two speakers, at recent consecutive meetings, brought facts and information to their attention in concise, well delivered and enthusiastic talks.

Farming received first consideration, when the farm equipment committee presented J. G. France, county farm adviser for San Diego. Mr. France presented a complete summary of the county's agricultural resources, stating that $15,000,000 in wealth was brought to the county this year by farm produce of the county. This, he pointed out, was the city's biggest industry, despite the prevailing idea that the county was not an agricultural community.

A. E. Holloway followed with a brief talk pointing out that California agriculture was more thoroughly developed electrically than in any other state and urged especially that pains be taken to educate the farmer to the real necessity for adequate, safe wiring and high-grade installations. Only by such means could he be guaranteed continuous service at the most economical figure to himself, he said.

H. Jackson, industrial secretary of the Chamber of Commerce, was the speaker at the Dec. 2 meeting of the club. He gave the club an idea of the work the chamber is carrying on to interest industry in San Diego.

Rocky Mountain League Elects Trustees and Officers

At the annual election of members of the board of trustees of the Rocky Mountain Electrical Cooperative League, held at Salt Lake City, Utah, Dec. 1, the following were elected to serve for the coming year:

Jobbers

J. A. Kahn, president Capital Electric Company.
C. B. Hawley, manager Inter-Mountain Electric Company.
J. M. Perlewitz, manager Salt Lake City branch, Western Electric Company.
W. J. Berryman, manager electrical department, Mine & Smelter Supply Company.

Contractor-Dealers

J. V. Buckle, manager Buckle Electric Company.
G. R. Randall, manager Salt Lake Electric Supply Company.
G. W. Forsberg, manager Wasatch Electric Company.
J. G. Guiver, manager Holding Electric Company.

Manufacturers

Robert Miller, manager Salt Lake City branch, General Electric Company.
W. A. Moser, manager Salt Lake City branch, Westinghouse Electric & Manufacturing Company.
B. E. Rowley, manager Salt Lake City branch, Edison Electric Appliance Company.
T. J. Stevens, manager Stevens Sales Company.

Central Station

D. C. Green, vice-president and general manager Utah Power & Light Company.
P. M. Parry, commercial manager Utah Power & Light Company.
H. M. Ferguson, manager Salt Lake division, Utah Power & Light Company.
R. M. Bleak, superintendent lighting and appliance sales, Utah Power & Light Company.

Telephone Company

O. J. Hyde, manager Mountain States Telephone & Telegraph Company.

The board of trustees met on Dec. 8 and elected the following officers to serve for the coming year: C. B. Hawley, manager Inter-Mountain Electric Company, president; George R. Randall, manager Salt Lake Electric Supply Company, vice-president; R. M. Bleak, superintendent lighting and appliance sales, Utah Power & Light Company, secretary and treasurer.

Mr. Hawley succeeds H. M. Ferguson; Mr. Randall succeeds Mr. Hawley, and Mr. Bleak succeeds himself.

New Mexico Association to Hold Convention in February.—The 1925 convention of the New Mexico Electrical Association will be held at Albuquerque, N. M., Feb. 16-18, 1925. Convention headquarters will be at the Franciscan Hotel.

Utility Problems Discussed at Speakers' Bureau Meeting

In order better to acquaint the utility employees of Denver, Colo., with the work which their various companies are doing in the education and promotion of public speaking through the speakers' bureau of the Rocky Mountain Committee on Public Utility Information, a general meeting, the first of its kind in the mountain region, was held Dec. 4 with over 500 in attendance.

According to R. B. Bonney, chairman of the bureau, the occasion was also intended as a "recital" evidencing the work of the public speaking class which is now in the middle of its second year. Another purpose was to inform the employees attending the meeting of some of the problems of the local utilities with which they are associated.

Several numbers on the program were so arranged that exposition could be given to the work of the educational and service organizations of the industry such as the Utility Information Committee and the Electrical Cooperative League of Denver.

H. H. Argabrite, manager of the telephone department of the Western Electric Company in Denver and instructor of the speakers' class since its inception, was the headliner on the program.

COMING PACIFIC COAST ELECTRICAL ASSOCIATION MEETINGS

Hydraulic Power Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 1925

Underground Systems Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 1925

Meter Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 8, 1925

Accident Prevention Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7, 8, 1925

Overhead Systems Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 7-9, 1925

Apparatus Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 8, 1925

General Meeting, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 8, 1925

Inductive Co-ordination Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Prime Movers Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Safety Rules Bureau, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Executive Committee, Technical Section—
Hotel Fairmont, San Francisco, Calif.
Jan. 9, 1925

Washington Town to Receive Electric Service.—The town of Oroville, Wash., will be supplied with light and power by D. J. Broderick and Eugene Hockett, who have been granted a franchise for erection and maintenance of an electric lighting, heating and power system in the town. The project provides for erection of a dam on the Similkameen River.

Manufacturer, Dealer and Jobber Activities

Charles Hartley of Ogden, Utah, has opened a new electrical store at 2309 Washington Avenue, in that city, where he will handle, among other lines of electrical merchandise, Universal appliances. Mr. Hartley established an electric wiring and motor shop three years ago, and within a year added appliances and fixtures, making a complete electrical store.

The Estate Stove Company, Hamilton, Ohio, has announced the establishment of its Pacific Coast office and sample room in the Fitzhugh Building, 366 Post Street, San Francisco, Calif. Sidney A. Beck is the Pacific Coast representative of the company in the northern division of its territory.

The B. & R. Electric Supply Company has been appointed distributor of Westinghouse lamps in Denver, Colo. Bue Carlton, well known to the electrical industry of Denver as a jobber's salesman, is now connected with that company.

Benjamin Electric Manufacturing Company, formerly located at 847 West Jackson Boulevard, Chicago, Ill., has removed to 120-128 South Sangamon Street, that city. Its San Francisco, Calif., office and warehouse, formerly at 580 Howard Street, are now located at 448 Bryant Street. This company is featuring a fall window-trimming contest, which closes at midnight Dec. 31, 1924.

R. D. Phillipps has taken over part of the floor space in the Altadena Electric Shop, 749 Mariposa Street, Altadena, Calif., and installed a complete line of radio equipment.

The Tubular Woven Fabric Company has appointed R. F. Whitmore as sales representative of that company in the Rocky Mountain region. Mr. Whitmore is also the representative of Hart & Hegeman and the Johns-Pratt Company.

The New England Electric Company, Denver, Colo., has announced the addition of Harry LeClair to its sales force.

The Miller Company, Meriden, Conn., arranged an experimental campaign with the Public Service Company of Colorado early in December on portable lamps, preparatory to a major campaign to be staged in the early spring.

The Globe Electric Supply Company, Denver, Colo., has been appointed sales agent for the Transmission Tower Fabrication Company in Colorado, Wyoming, Utah, Idaho and northern New Mexico. The Globe company has also added a radio department, according to a recent announcement of Paul A. Douden, its president and manager.

A. M. Byers Company, Pittsburgh, Pa., has published Bulletin No. 26A, "What Is Wrought Iron?", which supersedes Bulletin No. 26.

The Pacific Electric Motor Company, Oakland, Calif., has announced the opening of a new modern service and industrial supply plant, well equipped and stocked for giving industrial electric service, at Tenth and Oak Streets, that city.

The Locke Insulator Corporation, Victor, N. Y., has announced the removal of its sales and engineering departments from Victor to the Maryland Trust Building, Baltimore, Md., where its executive offices are situated, effective Dec. 1. Effective Jan. 1, 1925, three new district offices will be established: One at 766 Illinois Merchants Bank Building, Chicago, Ill.; one at 803 Atlantic Building, Philadelphia, and the other at Victor, N. Y.

Gardner's Electric Shop, formerly at 2552 East Colorado Street, Lamanda Park, Calif., is now located at 3215 East Colorado Street, in the new store building erected by W. A. Gardner, owner.

O. S. Peterson Company, electrical contractor-dealer, formerly located at 316 East Seventh Street, Long Beach, Calif, is now occupying its new store at 642 American Avenue, that city. The entire floor space is given over to Maytag washing machines.

The Griscom-Russell Company, 90 West Street, New York, has placed on the market the G-R sectional condenser, which should have particular interest to oil refinery men. Built in two or more sections, it will operate either as a standard, reflux or partial condenser, and may also be used as a condenser and heat exchanger at the same time. It is described fully in Form 198, published by the company.

"Shorty" Sherman, of the Illinois Electric Company, Los Angeles, Calif., demonstrating that he knows how to follow through with the old apple chaser as well as he knows how to follow an order.

The Chandeysson Electric Company, St. Louis, Mo., is building a three-story reinforced concrete addition to its plant. The first unit is nearly completed.

The Ohio Brass Company, Mansfield, Ohio, has distributed a folder setting forth the advantages of its National trolley guard, which it is claimed will improve conditions at any trolley line crossing of steam railroad tracks.

The Detroit Battery Charger Company, Detroit, Mich., has announced a new battery charger, known as Debco Duplex, which it is claimed gives double charging efficiency and cuts the cost in half. Full details may be had by addressing the company at 2963 Grand River Avenue.

The P. A. Geier Company, Cleveland, Ohio, manufacturers of Royal electric cleaners, has announced a Prosperity Sales Contest, open to dealers' salespeople, beginning Jan. 4, 1925. One hundred and nineteen cash prizes aggregating close to $5,000 are offered to those who sell the largest number of Royal cleaners within the ten weeks of the contest. In addition, a cash bonus will be given to every entrant who qualifies by selling a small minimum number of machines.

Maydwell & Hartzell, Inc., San Francisco, Calif., has made public the fact that it has purchased the building occupied by it at Eleventh and Natoma Streets, that city.

The Wesco Company, Inc., Denver, Colo., has been appointed sales representative of the Triangle Conduit Company, Inc., Brooklyn, N. Y., in the States of Colorado, Wyoming, New Mexico and Utah. A complete line of armored cable, flexible metallic conduit and nonmetallic conduit will be handled.

The Ferrell Electric Company, Montesano, Wash., recently opened a new electric shop in that city, under the ownership of Robert Ferrell. It will engage in electrical contracting and conduct a retail store.

Alex Hibbard, Inc., has moved its offices in Denver, Colo., to 1940 Blake Street, where warehousing facilities and trackage are available.

The Electric Store, Eugene, Ore., a partnership composed of L. C. Mack and C. A. Elkins, was recently opened. The concern will do a general contractor-dealer business. Mr. Mack was formerly proprietor of Mack's Electrical Supply Company of Eugene, and Mr. Elkins was until recently a member of the electrical engineering department of the Southern Pacific Company at Beaverton.

The Westinghouse Electric & Manufacturing Company has recently put on the market a new 300-volt type LV autovalve lightning arrester for protection to 110 and 220-volt secondary circuits of distribution transformers. These arresters are said to be particularly valuable in sections where one distribution transformer serves an entire street, with low voltage lines running 500 to 1,000 ft. to the customers' premises. The protection of these circuits has always been a considerable source of trouble, especially in the summer time when watthour meter blowouts, flashovers, blown fuses and general trouble have often been caused by lightning discharges. This new type LV arrester has been designed to remedy this trouble. It has a split porcelain case containing four standard LV discs and two metal end plates to which 30-in. line and ground leads are attached. The breakdown voltage of the arrester is about 1,400 volts RMS, and the breakdown voltage of the watthour meter which it protects is 2,700 volts to the ground.

NePage McKenny Company, electrical engineers and contractors, Armour Building, Seattle, Wash., received the contract for electrical wiring in the proposed $400,000 Church of the Blessed Sacrament in Seattle.

Bailey, Wyatt & Lynge, electrical dealers, Seattle, Wash., have moved from 1623 Third Avenue to 1914 Fourth Avenue, where they have larger quarters for the manufacture, design and display of lighting fixtures.

Personals

Guy C. **Earl**, recently elected president of the Great Western Power Company, San Francisco, Calif., was born May 7, 1860, on a farm near Red Bluff, Calif. He attended the Oakland high

GUY C. EARL

school and the University of California, from which he was graduated with the degree of A.B. in 1883. Following his graduation, he studied law in the office of Estee & Boalt. In October, 1885, he was made chief deputy county clerk of Alameda County and in 1886 was admitted to the bar by the Supreme Court of California. He became assistant district attorney of Alameda County in July, 1887, holding the office for two years, and then retired to private practice in Oakland as co-partner with the late Judge S. P. Hall, under the firm name of Hall & Earl. He was elected state senator from Alameda County in November, 1892, and served four years. In July, 1895, he moved his law office to San Francisco and joined the legal staff of Garber, Boalt & Bishop. On the retirement of Judge Boalt from practice and the withdrawal of Judge Garber from the firm in 1896, he formed a partnership with Thomas B. Bishop, Charles S. Wheeler, L. M. Hoefler and William Rix, under the firm name of Bishop & Wheeler. He withdrew from this firm in 1900 and thereafter practiced law alone in San Francisco. In 1905 he organized the Great Western Power Company and since has been vice-president and general counsel. He has been a regent of the University of California since 1902. He is actively interested in agriculture and is the owner of several ranches. Mr. Earl is a member of Beta Theta Pi fraternity, of the Big C Society and the Order of Golden Bear of the University of California. He also belongs to the Bohemian Club, Faculty Club, Berkeley Club, Claremont Country Club, San Francisco Golf and Country Club and Tule Belle Gun Club, and is a member of the First Congregational Church of Oakland.

F. Wieser, dealer in electrical supplies at Woodland, Calif., recently paid a visit to San Francisco.

F. R. Smalley, active in practically all affairs of the San Diego Electric Club, and traffic manager for the San Diego Electric Railway Company, San Diego, Calif., resigned the latter position last month to accept the general managership of the Parlor Car Tours Corporation, a new company organized to conduct de luxe auto coach scenic tours between Los Angeles and San Francisco. Mr. Smalley is to make his headquarters in San Francisco.

Earl C. Myers has moved his appliance store into larger quarters at 30th and University Avenues, San Diego, Calif. The new store provides considerably more floor space and two large windows that are being used to good advantage in the display of electrical wares. Mr. Myers is pioneering in the use of colored flood lighting and stop lighting of his window displays.

C. E. Magnusson, dean of the college of electrical engineering, University of Washington, Seattle, Wash., addressed the November meeting of the Seattle section of the A.I.E.E. on the "World Power Conference," at which he was a visitor.

F. M. Kimball, manager motor department, General Electric Company, Boston, Mass., was recently a visitor in San Francisco, Calif.

O. Whitmire, for the past year Boston stores manager for the Western Electric Company, has been appointed to succeed R. B. Gordon as New York stores manager for that company.

A. F. Herwig, Public Utilities Bureau, Milwaukee, Wis., spent some time in San Francisco, Calif., recently.

C. E. Grunsky, president of the American Society of Civil Engineers, accompanied by his daughter, Miss Clotilde Grunsky, contributing editor of Journal of Electricity, both of San Francisco, Calif., visited Spokane, Wash., on Oct. 28 and 29 in the course of their journey homeward from Ann Arbor, Mich., where Mr. Grunsky presided at a convention of the Society. On Oct. 28 he was guest of honor at a banquet given by the Spokane branch of the American Society of Civil Engineers.

Earl W. Taylor, formerly Chicago, Ill., district sales manager of the Gainaday Electric Company, and more recently Pacific Coast district manager of the Voss Brothers Manufacturing Company, has been made district manager of the Home Appliance Company and will make his headquarters at 802 East Colorado Street, Pasadena, Calif., where he will feature Maytag washers.

L. A. Knott, representing the Sangamo Electric Company in San Francisco, Calif., recently left to attend a sales convention at the factory in Springfield. Ill.

L. A. Hobbs, who handles lighting equipment in Los Angeles, Calif., paid a recent visit to San Francisco.

Herbert C. Moss, electrical contractor, Seattle, Wash., received the contract for the installation of 103 ornamental street lights in the city of Kelso, Wash. The lights will be installed on concrete posts, with a Solux globe and glass canopy.

Clarence Hunt, Pacific Coast representative for Robbins & Myers Company, Springfield, Ohio, has left for a thirty-day trip through the Northwest and to the factory. Mr. Hunt will visit Portland, Ore., Seattle and Spokane, Wash., and other northern cities and will then go to Springfield, where he will spend some time.

P. P. Ashworth, distributing engineer, Utah Power & Light Company, Salt Lake City, Utah, read a paper on "The Distribution of Electrical Energy" before a recent meeting of the Salt Lake City Section of the American Institute of Electrical Engineers.

J. B. Odell, manager New York telephone distributing house of the Western Electric Company, has been appointed assistant to the president of that company.

Frank E. McKenna, manager of the Mountain States Power Company at Corvallis, Ore., has recently been elected to the city council of Corvallis.

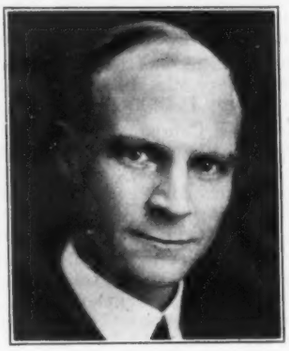
J. E. McAuliffe, Triangle Conduit Company, Inc., Brooklyn, N. Y., made a recent business trip to Denver, Colo.

R. J. McBride, who has been acting as distribution specialist in the Western Electric Company's New York telephone department, has been named Boston stores manager for the company, succeeding O. Whitmire.

C. R. Durling, president of the Monitor Controller Company, Baltimore, Md., recently visited the Pacific Coast in the interests of his firm. Mr. Durling spent some time in Los Angeles and San Francisco, Calif., and Seattle, Wash.

R. F. Whitmore has been appointed representative in the Rocky Mountain territory for the Tubular Woven Fabric Company, Pawtucket, R. I. Mr. Whitmore will make his headquarters in Denver, Colo.

E. T. Steel, for eighteen years associated with interests managed by Stone & Webster, Inc., and until recently assistant to the chairman of the board of directors of that company, recently arrived in Portland, Ore., to assume the duties of manager of the southern district of the Puget Sound Power & Light Company. He succeeds R. M. Boykin, who was made manager of the central division of the company, with headquarters at Seattle, Wash. Mr. Steel was



E. T. STEEL

born in Vermont and graduated from the Massachusetts Institute of Technology, Boston, Mass., in 1906. Immediately after his graduation he entered the employ of Stone & Webster, Inc. He has served as manager of the Ponce Electric Company, Ponce, Porto Rico, as general superintendent of the Savannah Electric Company, Savannah, Ga., and for the past twelve years has held executive positions in the Boston offices of Stone & Webster, Inc.

H. B. Sewell, manager of the Puget Sound Power & Traction Company, Bellingham, Wash., recently appeared before the Washington Club and spoke on the Baker River power project.

F. H. Woodward, general sales manager of the Great Western Power Company, San Francisco, Calif., recently visited the permanent electric home exhibit in Sacramento.

A. Emory Wishon, general manager of the San Joaquin Light & Power Corporation, Fresno, Calif., has gone to New York City to attend the meeting of the National Customer Ownership Committee of the N.E.L.A. held Dec. 9 and the meeting of the National Executive Committee held Dec. 10.

Charles A. Etem, manufacturers' representative, formerly of Minneapolis, Minn., recently established himself in Los Angeles, Calif., at 3804 Third Ave., where he will represent the Leich Electric Company, Genoa, Ill., and the Metsch Refractories Company, East Liverpool, Ohio.

F. W. Wight, of the United States Steel Corporation, San Francisco, Calif., recently spoke before the Sacramento Valley Electrical Society, Sacramento, Calif., and told of the development of steel. Mr. Wight illustrated his talk with lantern slides.

R. G. Boyles, until recently assistant superintendent of distribution, Southern California Edison Company, Los Angeles, Calif., has been made superintendent of distribution of that company. Mr. Boyles has to his credit a record of eighteen years of service with the Edison company, having entered its employ in 1906 as a lineman. After six months he was transferred to the overhead department of the Los Angeles district. In 1907 he was appointed foreman of the Los Angeles trouble department and retained that position until 1912, when he became district foreman at Redondo, Calif. At the end of three years he was made district foreman of the Po-

R. G. BOYLES

mona district, where a number of new lines was built under his direction. In 1922 he was appointed superintendent of the Long Beach district. Shortly after, due to the rapid growth of the company's operating department, it was deemed advisable to divide the distribution department into four divisions, and Mr. Boyles was made division superintendent of the coast division. From that post he was advanced to that of assistant superintendent of distribution.

W. C. Sterne, president and general manager, Summit County Power Company, Denver, Colo., was recently re-elected chairman of the Rocky Mountain Committee on Public Utility Information, Denver; **Ray Morris,** general commercial manager, Mountain States Telephone & Telegraph Company, was re-elected vice-chairman, and **V. L. Board,** general superintendent, Public Service Company of Colorado, was re-elected secretary and treasurer.

C. H. Tallant has been appointed advertising manager for the Drake Locknut Company, San Francisco, Calif.

W. R. Stinemetz, formerly manager of the heavy traction division, and **K. A. Simmon,** formerly manager of the light traction division, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., have been appointed assistants to the manager of the railway department of that company. **A. J. Manson,** until recently manager of the transportation division of the company's New York office, succeeds Mr. Stinemetz, and **E. A. Palmer,** formerly manager of the transportation division of the San Francisco office, will take Mr. Simmon's place. The changes have been made for the purpose of carrying on a more intensive study of transportation requirements and service to the transportation industry.

E. R. Nash, Monterey Electric Works, Monterey, Calif., was a recent visitor to San Francisco.

W. F. Raber, general manager of the San Diego Consolidated Gas & Electric Company, San Diego, Calif., returned from a trip to Chicago, Ill., late in November. He was appointed as one of the directors of the Standard Gas & Electric Company, the holding company under which many of the Byllesby properties are controlled. **H. H. Jones,** formerly general manager of the San Diego company and now vice-president of the Standard Company, in charge of operations of the Northern States Power Company, was also named on the board of Standard, as was **Samuel Kahn,** general manager of the Western States Gas & Electric Company, Stockton, Calif. The increased directorate has been created, it was announced, for the purpose of broadening executive responsibility in the functioning of subsidiary companies to include operating executives of the operated companies on the board.

E. S. Higging, of the Pacific Telephone & Telegraph Company, Portland, Ore., was recently in San Francisco, Calif., on business.

W. K. Cates, of the Westinghouse Electric & Manufacturing Company, San Francisco, Calif., has recently been transferred to Sacramento, where he will have permanent headquarters. Mr. Cates will assist "Steve" Gamble in sales engineering work in the Sacramento Valley.

George A. Campbell, Reno Light & Power Company, Reno, Nev., was a recent visitor in San Francisco, Calif.

J. B. Black, general manager of the Great Western Power Company, San Francisco, Calif., has been made vice-president of the company, succeeding Herbert Fleishhacker, who recently resigned. His rise in the utility field has been rapid, and the progress that has brought him to the position which makes him one of the youngest central station executives in the country has made his career an interesting one. Immediately upon graduation from the University of California in 1912, Mr. Black entered the commercial department of the Great Western Power Company. Six years later he was appointed general sales manager, and in 1922 he was made general manager. Mr. Black is a prominent and active worker in the electrical industry. He has served as president of the Pacific Coast Electrical Association and is now on the executive committee of that organization as well as a member of the public policy section. Prior to his election as president of the association he was vice-president

J. B. BLACK

for one term. He was formerly a member of the advisory committee of the California Electrical Cooperative Campaign.

Obituary

John Lyell Harper, vice-president and chief engineer, the Niagara Falls Power Company, Niagara Falls, N. Y., died Nov. 28, following an operation for appendicitis. Mr. Harper became associated with the Niagara Falls Hydraulic Power & Manufacturing Company in 1902 as assistant to the engineer, becoming chief engineer two years later. From that time until 1918 the installed capacity of the company's plants in the gorge below the falls grew under his direction from 14,000 to 160,000 hp. During the war the Niagara Falls Hydraulic company was merged with other interests to form the Niagara Falls Power Company, and Mr. Harper was made chief engineer, later becoming also vice-president. In the early part of his career he was employed by the Oregon Improvement Company and the Union Electric Company, both of Seattle, Wash., was operating and construction engineer with the Twin City Rapid Transit Company, and a year later became associated with I. W. Gray & Company, both of Minneapolis. Minn. As a member of the staff of Floy & Carpenter, consulting engineers of New York City, he had charge of the design and construction of the Apple River hydroelectric power plant for the St. Croix Power Company, Somerset, Wis.

Trade Outlook

San Francisco

With the holidays only a short while distant, Christmas buying has taken on an added impetus. Department stores in particular are crowded, and good sales volume is reported. General rains have done much to stimulate buying, especially in the adjacent country districts, and jobbers report numerous fill-in orders.

Electrical dealers state that they are experiencing a holiday demand for percolators, waffle irons, grills and toasters, but that sales have not yet attained the volume anticipated. Washing machines are moving well. Radio sets and parts continue to lead, and sales of high-priced sets are particularly good. Central stations are well pleased with the recent heavy rainfall.

An indication of substantial growth and prosperity is indicated by the construction record for the past eleven months. The number of building permits issued for that period exceeds that of any previous full year, with the exception of 1907, the year following the earthquake and fire.

Business circles in general are gratified by the recent announcement that San Francisco has been made the buying center for all supplies used in federal buildings west of the Rocky Mountains. These supplies include a large number of tools, brooms, sanitary articles, woodenware, hardware and numerous other items.

Los Angeles

The fall activity which has been evidenced in the wholesale and retail trade in Los Angeles during the past two months continues with prospects bright for further continuation during the holiday season and on into the new year.

Electrical retail conditions are much improved, and sales in some instances run above those of last year. This is especially true of electrical appliances, and, in turn, this prosperity is reflected in the larger household devices. Radio sales continue at an unabated pace, and some manufacturers find difficulty in keeping up to the demand being made upon them. The sale of parts and supplies also keeps up with the sale of sets. Jobbers and manufacturers report good business conditions prevailing, and the sale of appliances by the retail trade is reflected in increased sales on the part of the jobbers in their particular lines.

While the building permits shown for the past month are somewhat below the same period of last year, they are an improvement over the summer months. Real estate remains unchanged. Petroleum production has declined slightly, but the investment market has continued at the strong pace set during September.

Portland

The year just closing has been a satisfactory one for the large majority of the people of Oregon. Although in some sections weather conditions have caused crop failures, wheat and hay, constituting about two-thirds of the value of all Oregon crops, have been in ready demand at good prices. Wool is now well above the ten-year average price.

The shipping through the port of Portland continues to gain. The volume of new lumber orders is well above both production and shipments for the first time in several months. Mills for the past three months have been operating at about normal capacity and in excess of shipments and new business. Since election the situation has greatly improved, and the market is now distinctly a seller's market. Prices, particularly at the pine mills, have increased slightly. General optimism prevails regarding the 1925 outlook.

Since Sept. 1, rainfall at Portland has been about 15 in., or slightly above normal. Central stations are able to carry better than 90 per cent of their load on hydro.

Holiday sales to date have not been unusually heavy. Building in Portland this year is expected to break all former records.

Denver

Strengthening of the financial condition of the agricultural areas in this region, due principally to a successful beet harvest and a favorable market on sugar, is showing its effect in all lines of business. Coupled with continuing activity in the oil fields, the commercial and industrial outlook is a promising one.

Fall business as reported by various central stations on returns from the sale of power and merchandise took a spurt in October and held up in November. Unless all signs fail, December will produce a new record in these lines. There is a genuine feeling of optimism, especially in electrical channels. This is favoring additional construction and extensions by central stations. Appliance sales are on the upgrade and holiday demand for this class of merchandise, including radio, is very favorable. Reports from both jobbers and dealers verify this condition.

Autumn weather until the first of December retarded sales in clothing and fuel. Radio and the automobile business profited as a result and new building kept up. Building labor has prospered, and the only untoward aspect in this situation is the probability of wage increase demands early in the new year.

Spokane

Retail trade is improved, and excellent business is anticipated for the holidays.

Building permits in Spokane for the first eleven months of 1924 amounted to nearly $3,000,000, or 20 per cent more than for the same period in 1923.

Employment conditions in Spokane manufacturing plants are normal. A survey made in November by the Chamber of Commerce covered 128 plants, and in the majority of cases business conditions, present and prospective, were reported fair to very good.

Output of packing houses is normal, and deliveries of live stock are good, with good prices. On Nov. 20, 54 carloads of stock were received, this being a record. The woodworking plants all report improved conditions, and some are contemplating operating at two or three shifts in order to take care of increased orders.

The mines of the Coeur d'Alene district in Idaho will show a production of $25,000,000 worth of minerals for 1924, of which amount approximately 20 per cent will be distributed as dividends.

Seattle

Seattle electrical jobbers and dealers report Christmas buying well under way, sales of tableware and domestic appliances showing especial strength. Christmas tree outfits are becoming more in demand each year, and sales have started on these, although not strongly. Range sales have shown considerable increase, due to various cooking school demonstrations, which were largely attended. Lamp sales, both residential and industrial, are encouraging and for the beginning of the season are above normal. Prices in all lines generally are holding firm.

An extremely marked improvement in the lumber industry is noted since the recent election, with increasing confidence on every hand.

Building is holding up, with much activity in construction of the better types of homes. During the third week in November, permits for sixty-nine homes were issued, a record for this season of the year. There are few business buildings planned for the winter, but a number of apartments and flats are contemplated.

Unemployment has been increasing, due to migration of workers to Seattle upon cessation of seasonal work in Alaska, eastern Washington and Idaho and completion of several large hydroelectric and reclamation projects near Seattle.

Salt Lake City

Merchants generally report business as good, with the Christmas buying stimulus very much in evidence. Electrical dealers are securing a fair share of Christmas business.

The announcement made by the Utah Power & Light Company that work will be under way in the near future on the construction of Utah's largest hydroelectric plant at the Cutler site on the Bear River, with the expenditure of $5,500,000 and the employment of 1,000 men for two years, is an excellent indication of the favorable outlook for future business in the Intermountain territory.

The mining industry continues to thrive, and during the latter part of November, Park City, one of the largest silver-lead camps in this territory, surpassed all records for ore output after operating steadily for a period of fifty years.

The building of the Salt Lake basin irrigation project is now assured by President Coolidge's approval of the appropriation by Congress of $1,275,000 for that purpose. The expenditure of this amount of money and the construction of this project mean much to the prosperity of this section, where irrigation is the very life of the agricultural industry.

THE PACKARD PAGE

Auto Phase Changing Transformer*

By R. W. Beard

The Packard Electric Company during the past few years has built a large number of Auto Phase Changing transformers. They have been supplied in large quantities for transforming from three to two phase. Most of these units are built for 230-volt operation, although in some cases the transformation is required on 460 volt and 2300-volt systems.

The demand for these units has grown out of the fact that there are still being pressed into service by the industrial companies, a considerable number of two-phase motors. These motors in many instances are still in good operating condition in spite of their age and two-phase service is demanded to feed them.

The power companies are not especially anxious to supply two phase and are attempting to standardize as much as possible on three phase systems in all of their extensions. For that reason the auto phase changing transformer has been adopted in most instances and is the logical solution to the problem where the condition as outlined above exists.

The demand in most cases is for an indoor dry type unit mounted compactly in a sheet steel casing and arranged for wall mounting at a point convenient to the location of the motor or motors to be supplied. This is especially true where the transformation is from 230-volt, three-phase to 230-volt two-phase or from 460-volt three-phase to 460-volt two-phase.

Where the size of the unit is increased above 25 kva. output or where the unit is designed for 2300 volts or higher, it is preferable to use the oil immersed type. The construction then becomes very similar to that of an ordinary distribution or power transformer with four leads conveniently brought out and plainly marked for connection to the two systems. Such units are of the oil immersed and self-cooled type.

Due to the auto transformer design the unit is much smaller and more compact than the output rating would lead one to expect. The equivalent parts are less than 25% of the requirements of an equally rated double wound transformer. In other words, a given amount of work is accomplished with a saving of about 75% in material, and this enables the efficiency of the unit to be materially increased—running somewhat over 99% in most cases. From the operator's standpoint, therefore, the auto phase changing transformer is an ideal piece of equipment wherever phase transformation is required without voltage transformation.

The element is of the three-legged type and is clearly illustrated by Figure 1. The windings are on the two outer legs and are interconnected by means of an internal strap properly tapped to each winding to give proper transformation without phase distortion.

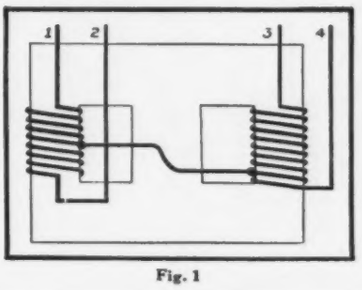


Fig. 1

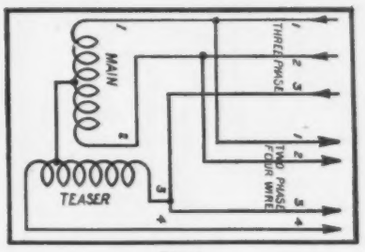
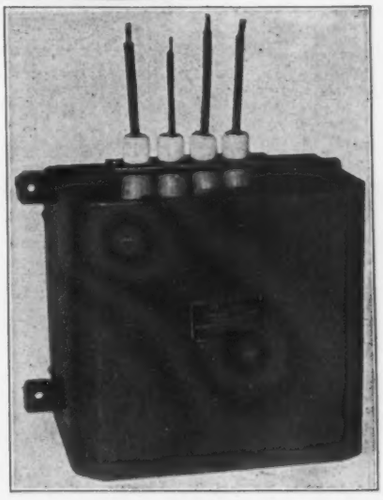


Fig. 2

Only four leads are brought out, three of which are common to both systems.

Figure 2 shows the schematic connections used and the method of tieing together the two systems. It is frequently desirable to have incorporated in the phase changer arrangements for 115/230 volt three-wire lighting service. When this is the case the lighting load must be definitely specified and one of the windings must then be strengthened accordingly. An additional lead is brought out, making a total of five external leads.

The Packard



Auto Phase Changing Transformer

Although Auto Phase Changing transformers are more numerous in the smaller sizes, there are many installations rendering efficient service in the large power class and there is no limit as far as their economical adaptation is concerned.

THE PACKARD ELECTRIC COMPANY, Warren, Ohio

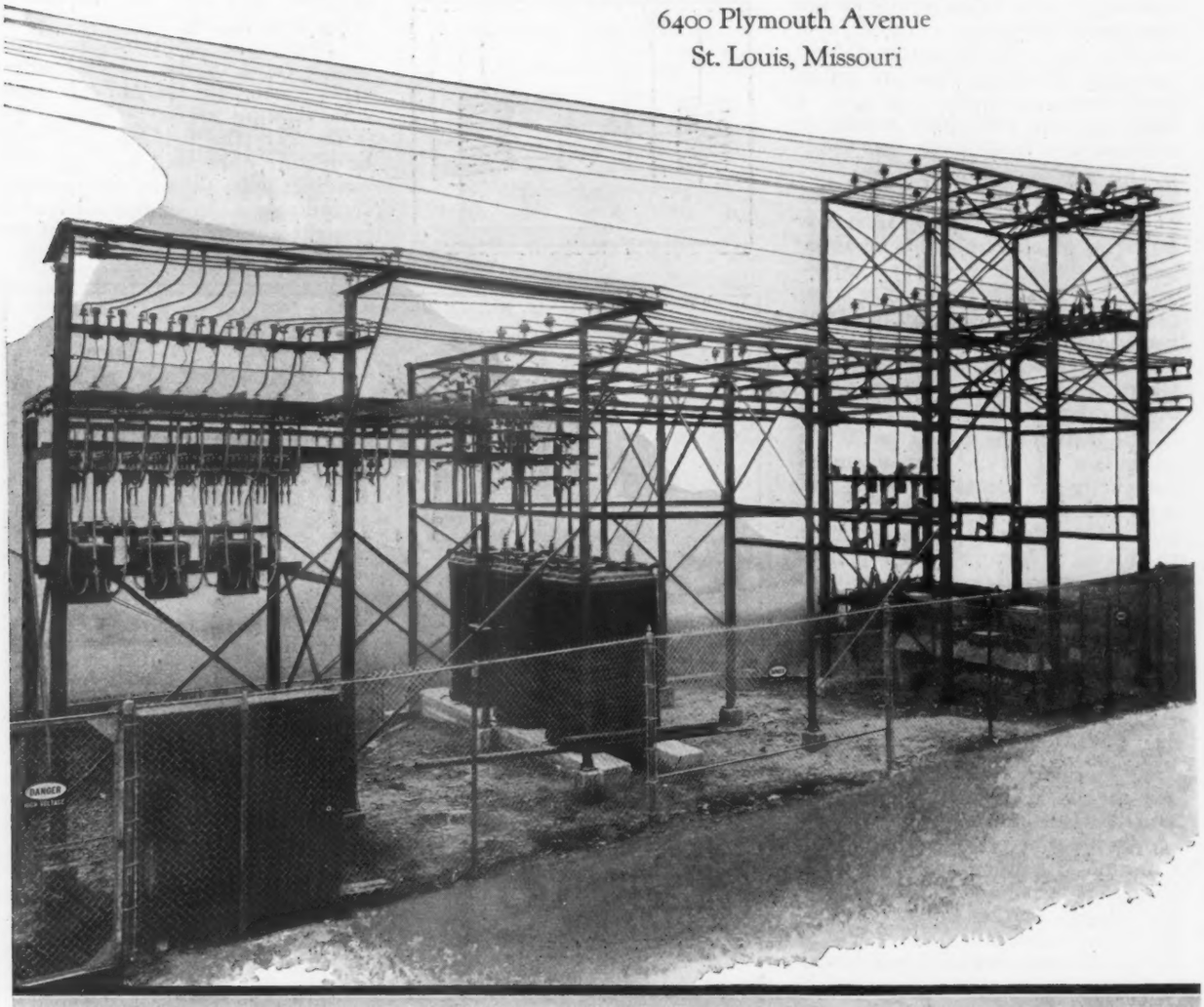
Transformer manufacturers since 1890

*Reprinted from Packard Doings (Monthly)

Wagner, Quality Transformers now in production will soon be serving somebody as satisfactorily as the many thousands of them already in the field.

On your next transformer order—*be "somebody."*

Wagner Electric Corporation
6400 Plymouth Avenue
St. Louis, Missouri



Wagner, Quality Transformers

distribution and power types in a wide range of styles and sizes

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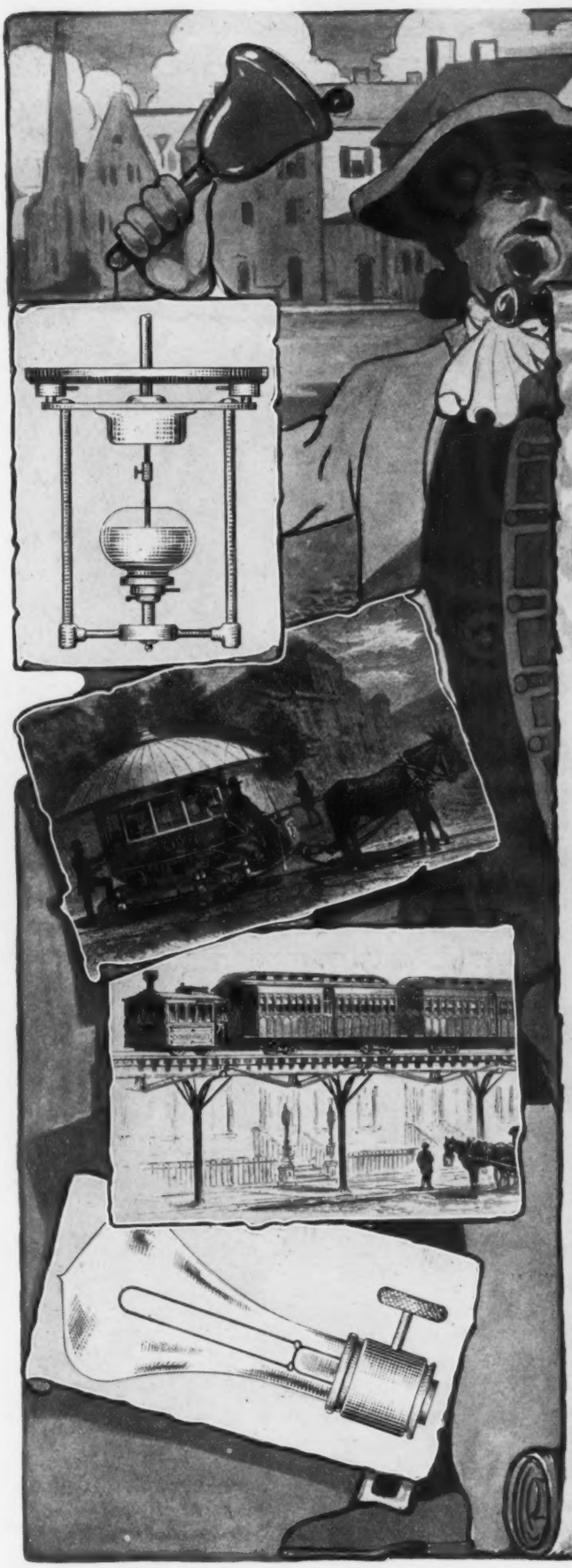
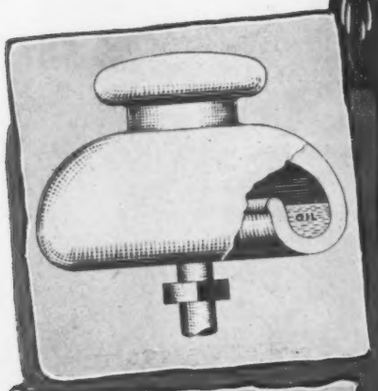


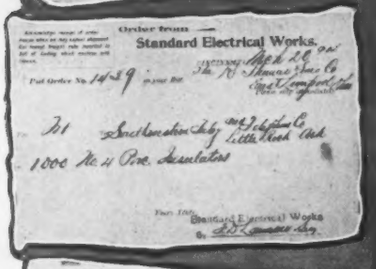
Hear Ye~ of the Electrique Colony

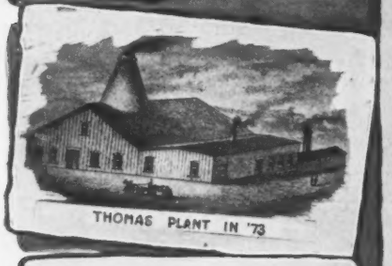
Back in '73, during Grant's Administration, America was laying the foundation for Industrial Supremacy of the World. New ideas were being advanced, new trades created, new businesses started and in all a golden future pictured. The overland stage was rapidly passing out while river and canal transportation was popular. The population was only 39 million, yet with fifty thousand miles the United States boasted of the greatest system of railroads in the world. The telephone then was but an experiment and the telegraph, though expensive, was slowly gaining commercial recognition. The horse-car provided local transportation and that year marked the first trial of the cable car. Artificial light was provided by the aid of tallow candles, oil lamps, gas burners and by the newest of all —electric arc lamps.

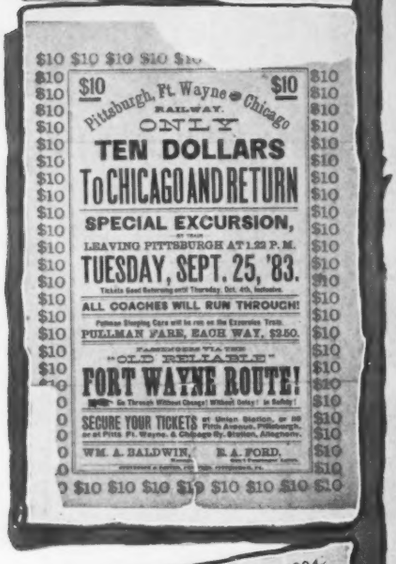
¶ During that year, another industry was born. The firm of Richard Thomas & Son was established at what is now known as the Pottery Center of the World—East Liverpool, Ohio. The new concern started in a modest way as most businesses did in those days and produced clay knobs and specialties. Their business grew slowly but surely and from time to time the factory capacity was increased and facilities improved.

¶ The Electrical Industry which until then had been but a simmering possibility, now showed signs of active development. At the Philadelphia Centennial Exposition in 1876, the first successful telephone was exhibited by Dr. Bell. In 1879 the Incandescent Lamp was invented by Thomas Edison. In 1881 the storage battery was invented, then called a "box of electricity," and in the same year Edison built his first steam generating plant and in the year following, the first water power plant.







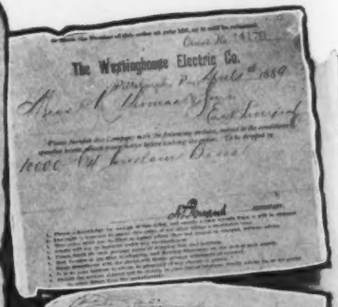


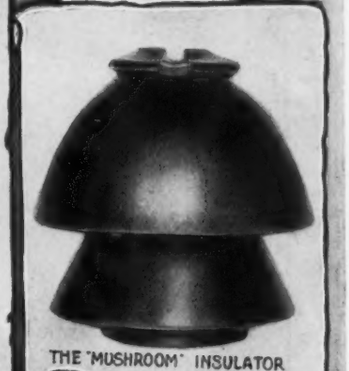
¶ This activity soon influenced extensive experiments in the "Thomas" plant and in January, 1885, the first "Thomas Quality" porcelain was made. At the start, only one design of insulator was produced, the first shipment going to the U. S. Electric Lighting Co., Chicago, at the time of the organization of the National Electric Light Association. Later, special shapes such as lamp buttons, socket keys, cut-out blocks, etc. were made. In 1887, about the time the first practical electric street railway was built (by F. J. Sprague in Richmond) "Thomas" electric accounts revealed such names as Brush Electric Association, Detroit Electric Works, Pittsburg Electric Co., Central Electric Co., Keystone Light & Pr. Co., Westinghouse Electric Co., et al.

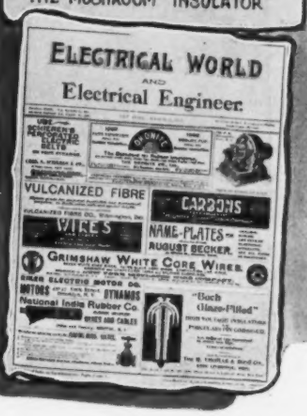
¶ In 1892, the firm of The R. Thomas & Sons Co., was incorporated under the laws of the state of Ohio. The "Thomas" line then consisted of three outdoor types of Insulator and nearly one hundred designs for interior wiring. In 1893, all of the porcelains used in the lighting arrangement for the World's Fair at Chicago, installed by Westinghouse, were "Thomas." The third issue of the "Thomas" catalog appeared in 1894 and nearly 300 insulators were illustrated.

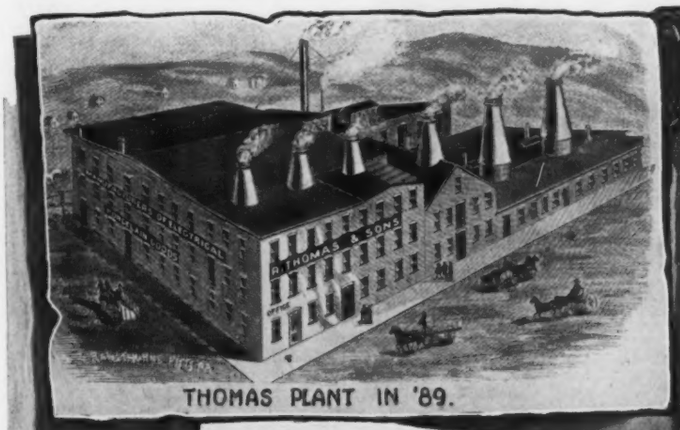
¶ Up to this time, transmission voltages were quite moderate, being regulated somewhat by the capacity of the insulators then available. Early in '94, Thomas Ceramists commenced a diligent study of Insulator Design in an effort to satisfy the demands of the Engineering World. Much could be written, if space permitted, of the tireless study, unique developments, discarded trials and progress made during that period. But suffice to say, perseverance, skill and thorough working knowledge of the fictile arts again brought victory to the firm of "Thomas." Early in '96 the first "Boch" Glaze-Filled Insulator was perfected, later to be patented. It was the first multi-part high voltage porcelain insulator manufactured. It represented the initial step toward making possible the transmission of electrical energy at higher voltages. One of the first orders recorded came from J. G. White & Co. Other early users were Montreal & St. Lawrence Lt. & Pr. Co., Helena Water & El. Pr. Co., Staten Island Electric Co., Pike's Peak Pr. Co., Montgomery Water Pr. Co., Jacques-Cartier Power Co., Salt Lake City Water and Electric Pr. Co., and many others. Although developed over a quarter of a century ago, it is interesting to note that many of these first insulators are still in service today.

¶ And so, we can leaf through the chronicles of "Thomas" history, reviewing many interesting accounts of the past, revealing definite milestones of progress made, reciting fiction-like tales of the achievements of this pioneer organization, but all to be considered as merely "part of the day's work."









THOMAS PLANT IN '89.

THE FIRST HI—TENSION INSULATOR.

¶ Again in 1917 it appeared to be the "Thomas" heritage to still further advance the art of Insulator Design by perfecting the Hewlett unit. It is now a matter of record just what "Thomas" skill and master-craftsmanship accomplished in that instance. Today the Hewlett type of Insulator is a commercial standard while then it was but a respected specialty. The superior knowledge and ability of The Pioneer was again required and thus another "Thomas" success was recorded. The importance of this latest achievement is manifest by the growing demand for Thomas Link-Type Hewlett Insulators and by the marked absence of failures among the thousands of these cementless units that have gone into service since in all parts of the world.

¶ Today we feel amply fortified in skill and knowledge for the new and modern era in which we live. We stand ready with improved facilities and increased capacity to meet the most exacting needs of the trade. The mammoth expansion program which we laid out for ourselves about a year ago is rapidly nearing completion. We realize that theories and practices are constantly changing; that one must be alert to keep step with the times. We appreciate too that our fame of yesterday can not carry us through the highly competitive period of today; that to prolong an unblemished reputation one must not only equal but better the accomplishments of the past. With these things uppermost in our mind, with a definite goal in view and with a determination to make new marks in the future, we close this Our Fiftieth Year. It is with sincere thanks and appreciation to those who have so contributed to our success that we renew our allegience to the industry which we have seen grow from its infancy and to which we have been a proud and willing servant.

The R. Thomas & Sons Co.
East Liverpool, Ohio
New York Boston Chicago
Pittsburgh London

Western Electric Company

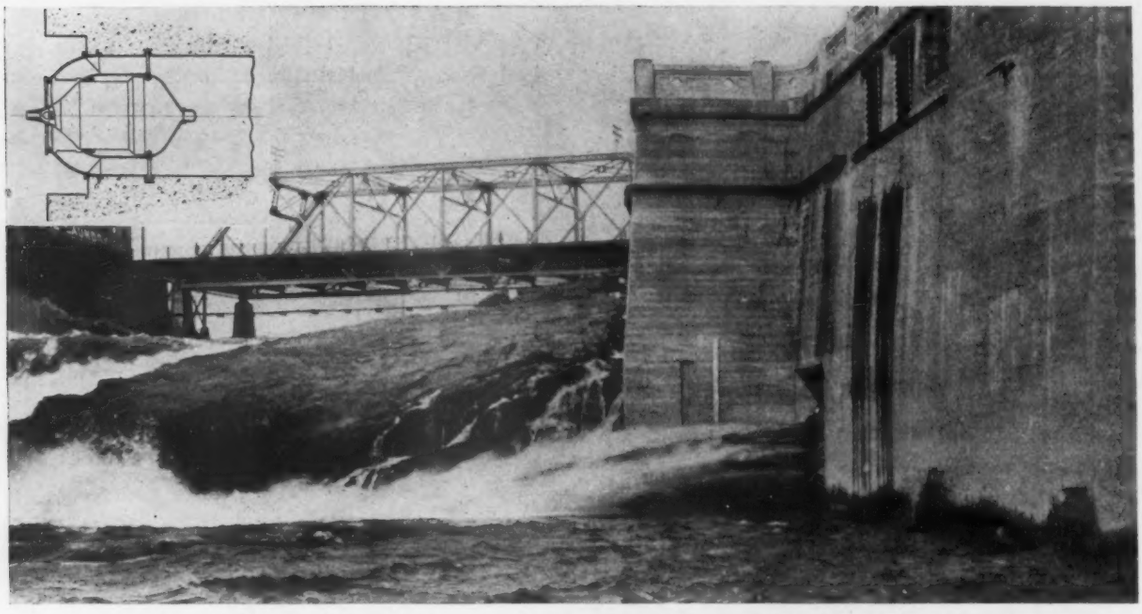
I. P. Morris Department

The Wm. Cramp & Sons Ship & Engine Building Co.

Richmond and Norris Sts., Philadelphia

Designers and Builders of

JOHNSON HYDRAULIC VALVES



Discharge from a 62" Johnson Discharge Regulator, operating under a head of 58 feet and installed in the Washington Water Power Company's plant at Spokane, Washington

THE REGULATOR shown above is connected by electrical control to the turbine gates, in such a manner that for small gate openings the valve will be opened and at large gate openings, will be closed, thereby insuring an ample quantity of water for use in the hydraulic plant below, should the unit in the upper plant be shut down or operated under light load.

This type of regulator is particularly adapted to any automatic regulation or free discharge service, such as regulation of flow from reservoirs and irrigation dams. It operates without vibration or excessive wear and will remain indefinitely at any intermediate setting between the wide open and closed positions. It is absolutely tight when closed.

WRITE FOR JOHNSON VALVE BULLETIN NO. 3.

ASSOCIATED COMPANIES

THE PELTON WATER WHEEL CO., SAN FRANCISCO AND NEW YORK

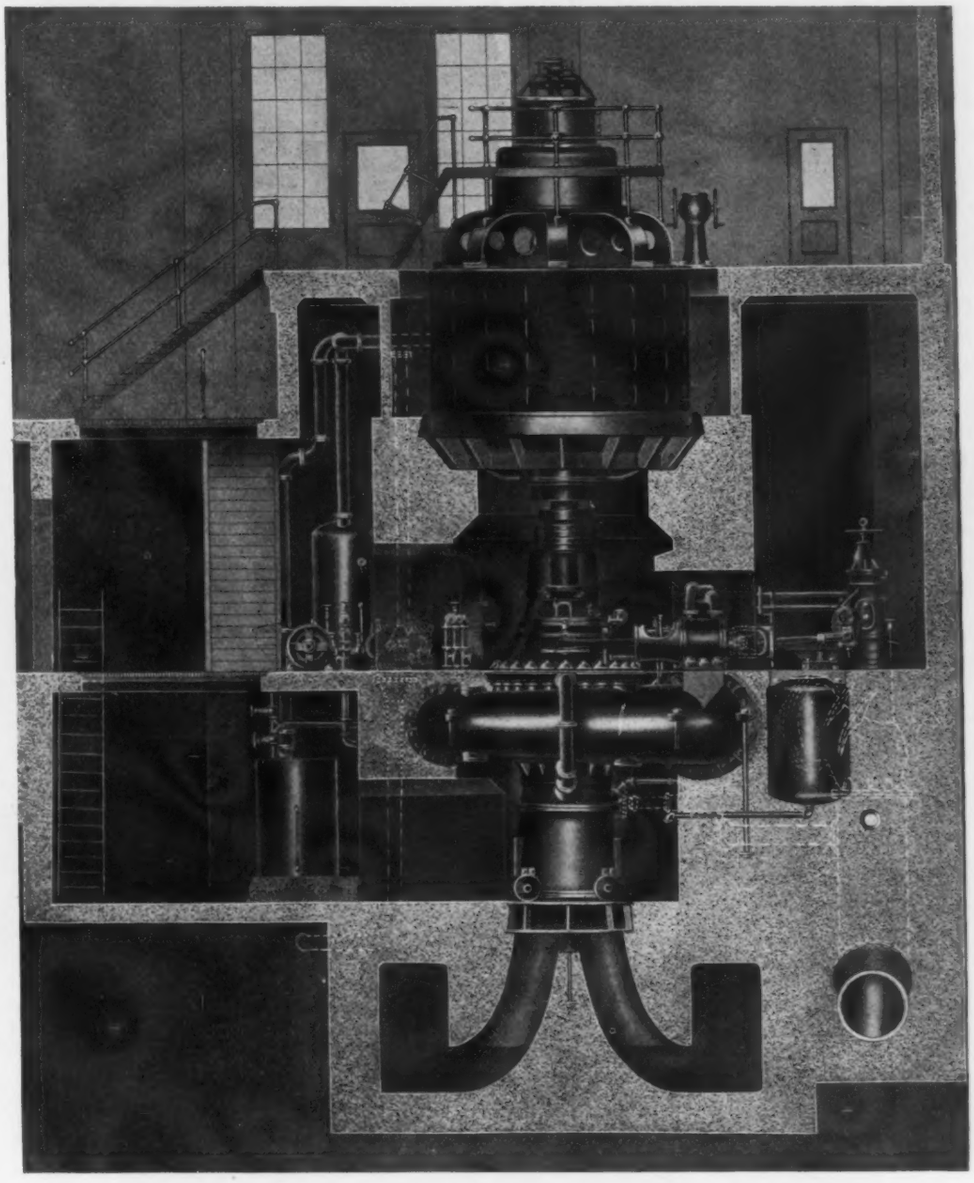
DOMINION ENGINEERING WORKS, LTD., MONTREAL, CANADIAN LICENSEES

M. HILPERT & CO., RIO DE JANEIRO, BRAZILIAN LICENSEES

PELTON

Oak Grove Turbine Started Aug. 4

World's Highest Head Reaction Turbine Develops 35,000 H. P.



THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2985 Nineteenth St., SAN FRANCISCO 100 Broadway, NEW YORK

Divisional Office in American Trust Building, Birmingham, Ala.

Associated Companies: Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia; Dominion Engineering Works, Montreal; M. Hilpert & Co., Rio de Janeiro.

Pacific Coast Representatives: The M. W. Kellogg Co., Jersey City, N. J.; Larner Engineering Co., Philadelphia, Pa.; De La Vergne Machine Co., New York, N. Y.

PELTON

THE PACKARD PAGE

A Simple Method of Changing Taps*

EXTERNALLY OPERATED

BY R. W. BEARD

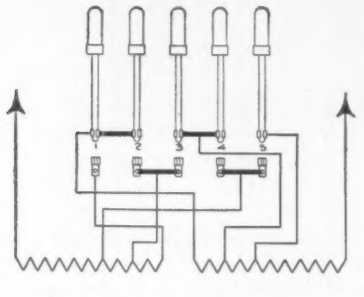
Reduction of primary voltage feeding a transformer bank, due to varying loads on the system, has always made it necessary to provide Power Transformers with a series of taps to compensate for this line drop and bring the secondary voltage back to a point where no reduction in power will be experienced on connected motors.

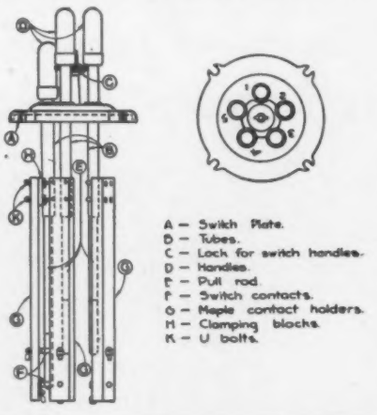
General practice in the past has been to provide a terminal board to which all taps are brought. Change from one tap to another is then made by opening up the manhole cover and rearranging the copper straps on the oil immersed terminal board.

Although the change, obviously, is not of a very frequent nature, it is very important that when it is needed the facilities for making the change be as simple and as quickly accomplished as possible.

The Packard tap changer eliminates the necessity of opening the manhole cover and, therefore, offers no possibility for the entrance of moisture into the transformer. Change can be made in any kind of weather. The device is absolutely fool-proof. Anyone can operate it without the possibility of making the wrong connection, or of dropping tools into the transformer.

Each handle is numbered and the blueprint accompanying the transformer shows by number which handle to plug in to give any desired tap voltage. An ingenious selector plate prevents more than one handle being plugged in at the same time. It is, of course, necessary to throw off the power before operating the tap changer. The contact points are very liberally designed, widely separated, immersed in oil and insure a positive rugged contact—so desirable in any switching arrangement.



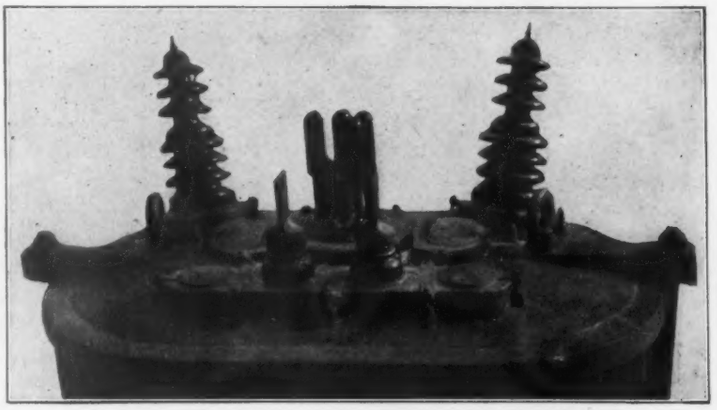

A — Switch Plate.
B — Tubes.
C — Lock for switch handles.
D — Handles.
E — Pull rod.
F — Switch contacts.
G — Maple contact holders.
H — Clamping blocks.
K — U bolts.

This simple yet effective tap changer can be furnished on power transformers of any size or voltage.

Control of the patents covering this tap changer have recently been acquired by the Packard Electric Company. Many leading operating engineers have strongly approved it for adjusting the ratio on the high side of Power Transformers.

The accompanying illustration will give an idea of the outside appearance of the transformer into which is embodied this externally operated Tap Changing device.

The Packard



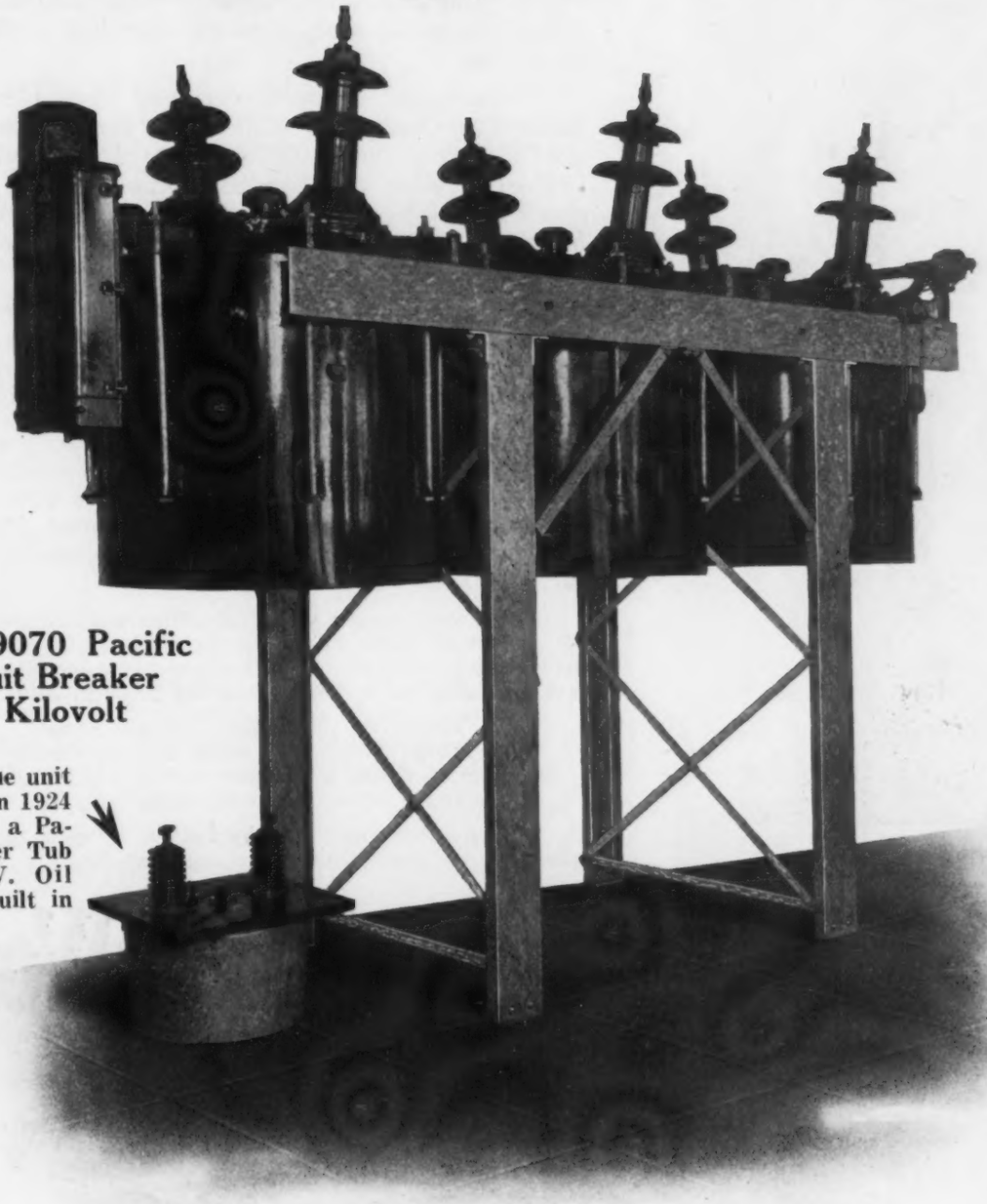
TAP CHANGER
for
PACKARD TRANSFORMERS

Transformers for every service that render but one kind of service—the best.

THE PACKARD ELECTRIC CO., Warren, Ohio
Transformer Manufacturers Since 1890

*Reprinted from Packard Doings (Monthly)

# of Switch-gear! 1906 to 1924



Type 9070 Pacific Circuit Breaker 70 Kilovolt

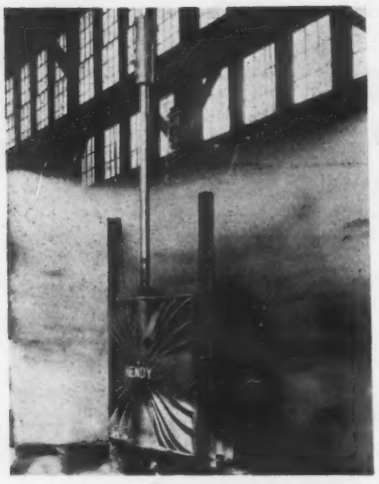
Single pole unit —made in 1924 to repair a Pacific Fiber Tub 60,000 V. Oil Switch built in 1908.

A graphic illustration of the growth, and of the long life, of Pacific Oil Circuit Breaker design

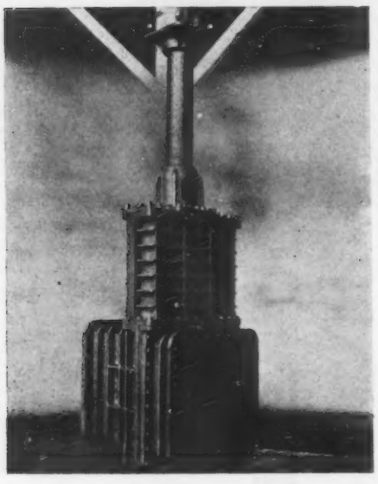
827 FOLSOM ST. SAN FRANCISCO
INTERURBAN BLDG. DALLAS
HOGE BLDG. SEATTLE
FERGUSON BLDG., LOS ANGELES

PACIFIC ELECTRIC MFG. CO.
SAN FRANCISCO — CALIFORNIA

Send For Bulletin No. 9



5 x 5 Sluice Gate for 135′ Head Built for Big Wood Canal Co.



30 x 30 Sluice Gates for 100′ Head for U. S. Reclamation Service

Butterfly Valves That Are Water-Tight

In the June first issue of this magazine we listed hydraulic equipment we then had under construction.

Since then we have received orders for two butterfly valves, 138″ in diameter for 155′ head for the California Oregon Power Company, Copco No. 2 project. These valves when completed will weigh about forty-five tons each. They will be constructed of steel throughout and with discs, equipped with our **patented seal rings.**

These Seal Rings are made of cast bronze and are adjusted after the valves are installed in the pipe line. Butterfly Valves of our manufacture are practically water tight as shown by their remarkable performance under test.

Recent shop tests gave a leakage of 2.6 per minute with 370′ pressure, when making a test on 72″ valves which were equipped with these patented seal rings. This is an unusual performance for a valve of this type.

Last week we shipped after completion and test, three 104″ Butterfly Valves, built for the City of San Francisco's Hetch Hetchy project. They are now being installed. They gave the following results with a test pressure of 215′ head.

Valve No. 1—7 cubic feet per minute
Valve No. 2—5¼ cubic feet per minute
Valve No. 3—5 cubic feet per minute

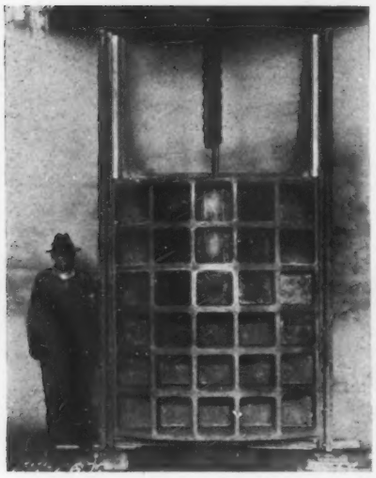
One of the above valves is illustrated on this page.

When specifying Butterfly Valves, it would be well to remember the performances, as noted above.

Joshua Hendy Iron Works

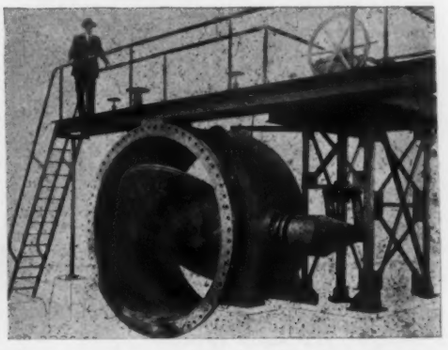
Established 1856

Works: Sunnyvale,



5 x 6 Sluice Gate for 146′ Head for Salt River Valley Water Users' Assn.

72″ Butterfly Valves for 325′ Head for Drum Plant—Pacific Gas and Electric Company



104″ Butterfly Valve for 130′ Head—One of Three Built for Hetch Hetchy—Block Out Cored Holes and Improve Hand Rails.

Other equipment that this company has recently constructed for great Hydro-Electric, Reclamation and Irrigation Projects on the Pacific Coast, include the following:

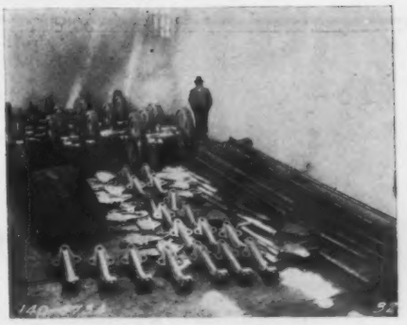
For the Pacific Gas and Electric Company—Drum Development: 2—5 ft. x 5 ft. elec. operated Sluice Gates for 100 ft. head; 2—72 inch elec. operated Steel Butterfly Valves for 325 ft. head; 11—72 inch to 52 inch Steel Expansion Joints for heads from 282 ft. to 1,375 ft. For Pit No. 3 Development: 3—7 ft. x 7 ft. Hyd. operated Sluice Gates for 100 ft. head; 2—8 ft. x 18 ft. elect. operated Sluice Gates for 40 ft. head; 3—129 inch elect. operated Steel Butterfly Valves for 130 ft. head.

For United States Reclamation Service—Gerber Dam Klamath Project: 3—30 inch by 30 inch High Pressure Steel Sluice Gates. Hubbard Dam-Flathead Project: 2—24 inch Balanced Needle Valves. Tieton Dam—Yakima Project: 1—24 inch Balanced Needle Valve; 16 Sluice Gates of various sizes.

For City and County of San Francisco—Hetch Hetchy Development: Moccasin Creek Penstock—3—104 inch elect. operated Butterfly Valves for 130 ft. head; 10—108 inch Steel Expansion Joints. Bay Crossing Pipe Line—30—60 inch Steel Expansion Joints.

We Specialize in Designing and Manufacturing: Sluice Gates, Tunnel Gates, Gate Valves, Radial Gates, Needle Nozzles, Butterfly Valves, Gate Operating Mechanisms, Electric Hoists, Rock Cars, Concrete Cars, Crushers, Crushing Rolls, Rock Screens, Water Wheels.

Your correspondence and inquiries solicited



Group of 9 Operating Mechanisms for Taintor Gates—knocked down ready for shipment to—Salt River Valley Water Users' Assn.

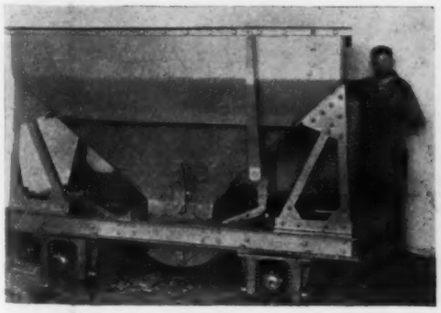
24" Needle Valve for U. S. Reclamation Service

Group of Interlocking Operating Stands Built for U. S. Reclamation Service

San Francisco, Cal. U.S.A.

75 Fremont Street, San Francisco, California

Santa Clara County, California



Concrete Construction Car Used in Building Don Pedro Dam.

5' x 5' Sluice Gate for Pacific Gas and Electric Company's Drum Project

50-Ton Construction Hoist for Japan.

To—

Electrical Manufacturers

THE annual publication of the cross-indexed directory of electrical manufacturers and their Western sales representatives will appear in the

October 15, 1924 Issue

Under the name of the manufacturer are listed the names and addresses of his Western sales representatives, agents or district offices, as

HURLEY MACHINE CO., Cicero, Ill.——J. W. Ferry, Western Sales Representative, San Francisco; Thor Shops, San Francisco, Los Angeles, Oakland, Portland, Seattle; Pacific States Elec. Co., San Francisco, Oakland, Los Angeles, Portland, Seattle.

This list is prepared and printed as a service to our subscribers who are the Buyers of electrical equipment, appliances and supplies here in the West.

We extend this opportunity to include your name in this listing without charge. Just fill in the form outlined below and mail to the San Francisco office.

Name of Mfr. .....

Address .....

City ..... State .....

Products .....

Names of Western Agents

Company	City	State

To—

Western Sales Agents

THE annual publication of the cross-indexed directory of Western sales representatives and the electrical manufacturers for whose lines they are the sales agents will appear in the

October 15, 1924 Issue

Under each name of a Western agent are listed the manufacturers for whose lines the agent is a sales representative, as

ALLIED INDUSTRIES, INC., San Francisco, Los Angeles, Seattle, Portland——Duraduct non-metallic conduit; Duracord .portable cord; T-V knife switches, safety switches; Steel City boxes; Buckeye conduit, Realflex armored cable; Youngstown Sheet & Tube Co.; Trumbull-Vanderpoel Elec. Mfg. Co.; Tubular Woven Fabric Co.; Findlay Elect. Porcelain Co.; Collyer Insulated Wire; E. M. Smith Co.

Western buyers are particularly interested in knowing **where** here in the West their requirements may be secured.

To have this information available often means a sale. It is to your advantage to see that your firm as well as those whose lines you sell are included in this directory. Just fill in the form below and mail to the San Francisco office.

Name of Sales Agent .....

Address .....

City ..... State .....

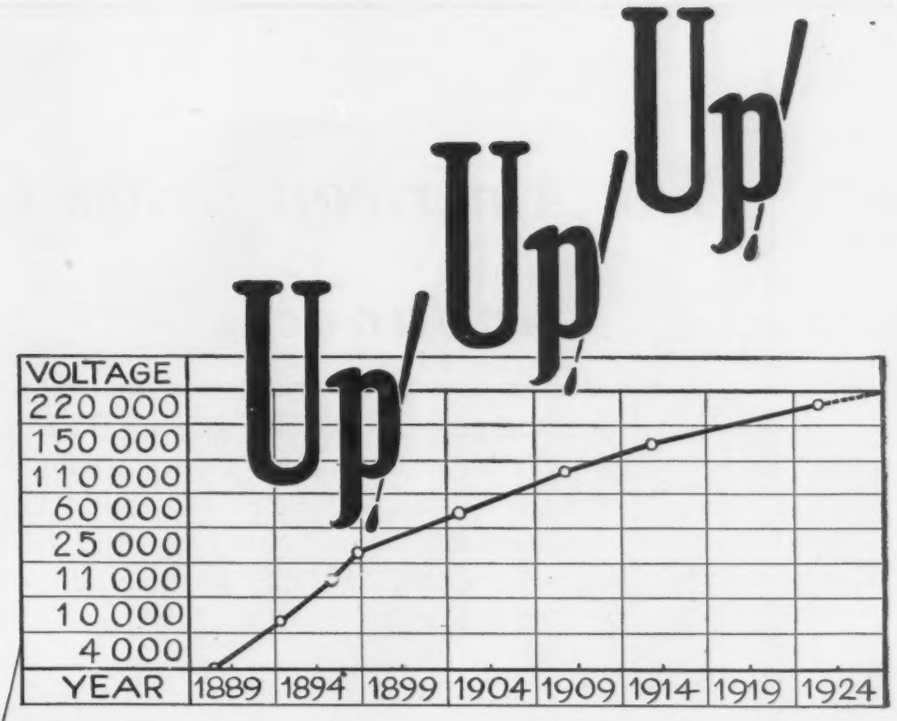
Representing

Company	City	State	Product

Journal of Electricity

883 Mission Street

San Francisco, Calif.



THE continuing demand for higher voltage and more power is insistent. The response to this demand in generating, transformer and switching equipment has necessitated a corresponding increase in insulator quality and quantity.

Locke Porcelain insures quality. Locke capacity insures meeting demand. Backed by thirty years special experience (the oldest organization of its kind in this country), Locke insulators insure service.

Development for the future is insured by the unequalled facilities for research and test; and by the cooperation of the personnel of the famous laboratories of the General Electric Company—available, and cooperative, with Locke.

New demands require new designs. Test equipment to duplicate abnormal line conditions is available. Suspension insulator strings can be tested to flashover or, under abnormal conditions, to destruction.

Electrical tests of insulators can be made with any current frequencies and wave lengths known to exist on high voltage lines, singly or in combination. Complete tests so made support all specifications of Locke insulators.

LOCKE INSULATOR CORPORATION
Baltimore, Md., and Victor, N. Y.

PACIFIC STATES ELECTRIC COMPANY
San Francisco Los Angeles Oakland
Portland Seattle Spokane
Exclusive Pacific Coast Sales Agent

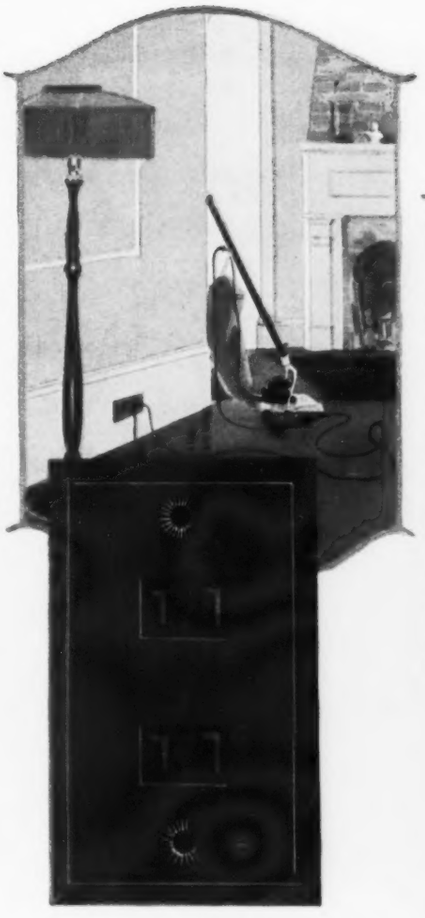
LOCKE
PORCELAIN

The American Brass Company

Announces a change in its sales arrangements for the Pacific Coast covering the distribution of its weatherproof wire and cable. These products, which have heretofore been distributed by the PACIFIC STATES ELECTRIC COMPANY will hereafter be sold direct by THE AMERICAN BRASS COMPANY'S organization with offices at San Francisco and Los Angeles.

It is a pleasure to state at this time, however, that the arrangement between the ANACONDA COPPER MINING COMPANY, THE AMERICAN BRASS COMPANY and the PACIFIC STATES ELECTRIC COMPANY covering the distribution of Bare Wire and Lead Covered Cable Products of the former Companies still prevails. It is hoped that the services of these combined organizations in this respect will meet your every requirement.

THE AMERICAN BRASS COMPANY
General Sales Office **25 Broadway, New York**
ANACONDA COPPER MINING COMPANY
Western Sales Office **Conway Bldg., Chicago**



No. 990
Duplex Unit Receptacle

Connecticut-Bakelite
Plug

No. 7121 Bakelite Plate
with 6276 Toggle Switch

A Notable Contribution to the Art of Interior Decorating

There is an irresistible appeal to these new Connecticut Devices of Brown Bakelite. One is unconsciously drawn to them by their attractive design, workmanship and harmony of color.

The Duplex Unit Receptacle

Beauty and utility are combined in this receptacle, to make it the ideal device for use in apartments, hotels and homes where "good taste" predominates. Plate and receptacle are molded in one piece of Bakelite, which extends only ⅝ of an inch into the wall box, making it simple to install.

Bakelite Toggle Switch

This switch, with its rich brown "egg-shell" finished plate, acts as an ornament and harmonizes with other surroundings wherever installed. "On" and "Off" are clearly indicated in white letters on the handle, and the absence of metal prevents all possibility of shock.

A-1 Bakelite Plug

In the breakfast room—is enacted the first scene of the many events that transpire during a busy day, and if everything functions properly at the breakfast table, the day gets off to a good start.

The Connecticut-Bakelite Plug will do its share in the preparation of the "morning cup", because the riveted prongs and non-crumbling cap always insure a perfect contact.

For "Better Home Lighting", Specify Connecticut-Bakelite Wiring Devices

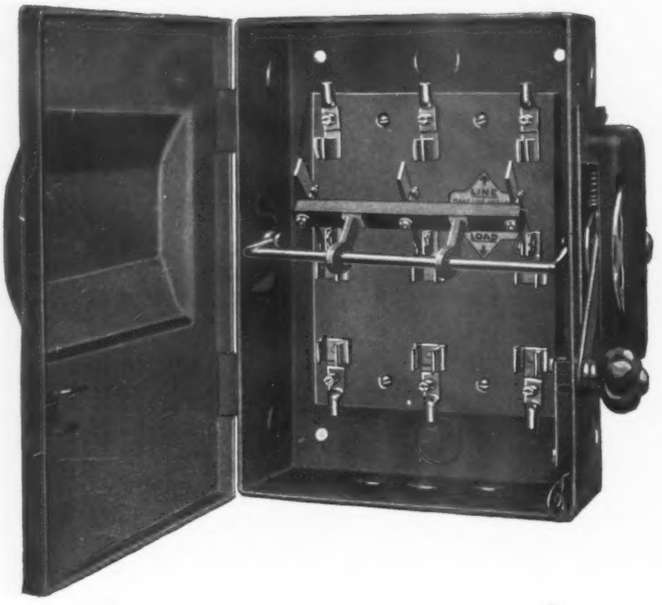
THE CONNECTICUT ELECTRIC MFG. CO.
MAIN OFFICE AND FACTORY: BRIDGEPORT, CONN.
New York Chicago San Francisco

CONNECTICUT "A-1" DEVICES

9-1-21

TRUMBULL-VANDERPOEL
TYPE "A"
SAFETY SWITCHES

For Heavy Duty Industrial Service



A Switch of the Highest Grade for use under extremely severe operative conditions — Competitively Priced.

These switches — Series A63 (fused) and Series A64 (unfused) — represent a single item in the Trumbull-Vanderpoel complete Safety Switch Line.

All types and sizes for Industrial, Entrance, and Meter Service work. All knife Switches and Battery Switches.

The Box:

Safety Type; Interlocked Cover. Fuses are dead when accessible.

New larger sizes allowing extra wiring space.

Large assortment of knockouts (easily removed) for convenient wiring.

Extra fine enameled finish.

The Switch:

Type A parts; machine made milled clip type.

Contact fingers sweated and pinned to blocks.

Current carrying parts generously proportioned to safely carry heavy overloads.

Accurately made, carefully assembled, with contacts adjusted and ground in.

The Mechanism:

Positive Quick Make and Quick Break.

Two springs operating together for additional strength.

Entire mechanism enclosed in drawn steel case on outside of box. Accidental breakage of spring, etc., could not cause short circuit.

Heavy steel handle. Door knob style wooden grip.

53 Fourth Street, Portland

532—1st Ave., South, Seattle

Western Representatives:

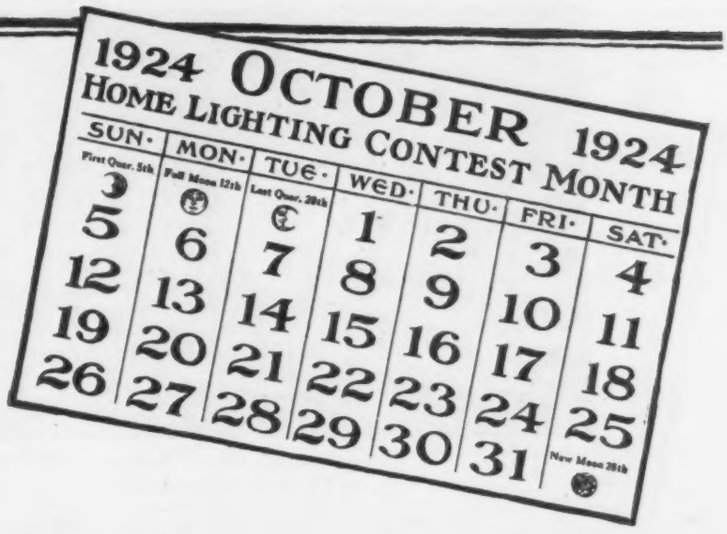
Allied Industries, Inc.

455 Second Street San Francisco

1256 Factory Place, Los Angeles

THE TRUMBULL-VANDERPOEL ELEC. MFG. CO.

BANTAM, CONNECTICUT


1924 OCTOBER 1924
HOME LIGHTING CONTEST MONTH
SUN· MON· TUE· WED· THU· FRI· SAT·
First Quar. 5th
Full Moon 12th
Last Quar. 20th
New Moon 28th
1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31

You still have time to start a Home Lighting Contest

Don't wait for the other fellow to start. You do it.

Join this great activity to protect the eyesight of our children by showing the people how to properly use electric light in the home.

Send for Plan Book containing methods of operation. Thousands of communities are basing their contests on it.

Time is getting short. See your light company, get in touch with the director of your district, and plan your contest now.

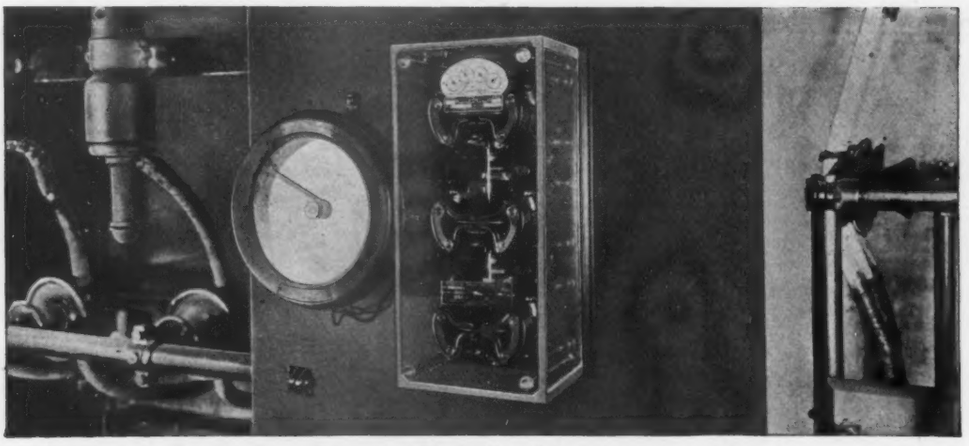
Remember all local contests must conclude by December 1st.

Additional List of Subscribers to the Lighting Educational Committee

L. Beyer & Company,
CLEVELAND, OHIO.
The Bryant Electric Co.,
BRIDGEPORT, CONN.
Central Tube Company,
PITTSBURGH, PENN.
Chicago Fuse Mfg. Co.,
CHICAGO, ILL.
The Frankelite Company,
CLEVELAND, OHIO.
Garland Mfg. Company,
PITTSBURGH, PENN.
Herwig Art Shade Lamp Co.,
CHICAGO, ILL.
Phil R. Hinkley,
CLEVELAND, OHIO.
Hygrade Lamp Company,
SALEM, MASS.
The Jefferson Company,
FOLLANSBEE, W. VA.
The Kayline Company,
CLEVELAND, OHIO.
Moe-Bridges Company,
MILWAUKEE, WIS.
National Metal Molding Co.,
PITTSBURGH, PENN.
Northern Electric Co.,
MONTREAL, QUEBEC, CAN.
The Perfectlite Company
CLEVELAND, OHIO.
Eugene F. Phillips Elec. Wks., Ltd.
MONTREAL, QUEBEC, CAN.
Steel City Electric Co.,
PITTSBURGH, PENN.
Albert Wahle Company,
NEW YORK CITY, N. Y.
The F. W. Wakefield Brass Co.,
VERMILION, OHIO.
The Okonite Co.,
PASSAIC, N. J.
Hubbard & Co.,
PITTSBURGH, PENN.
Corning Glass Co.,
CORNING, N. Y.
E. H. Freeman Electric Co.,
TRENTON, N. J.

HOME LIGHTING CONTEST

The
LIGHTING EDUCATIONAL COMMITTEE
680 Fifth Avenue · · · New York, N.Y.



Sangamo Four-wire, Three-phase Meter in service on the switchboard of the Missouri Pacific Hospital in St. Louis

Sangamo Four-wire, Three-phase Meter *for accurate metering* on unbalanced voltages and currents

ACCURATE metering on four-wire, three-phase circuits is possible on unbalanced voltages only by using three separate single-phase meters or a special type of three-element meter. The Sangamo Four-wire, Three-phase Meter is of the three-element type and records accurately on both unbalanced voltages and currents. It is also particularly useful where it is desired to obtain demand readings for which purpose the use of three single-phase meters is unsatisfactory.

Three single-phase meter elements are placed one above the other, each element having its disk mounted on the common shaft which thus records on the dial the total energy of the three-phase system. Each of the three voltage elements is connected from the neutral to one of the three phases. Iron barriers, suitably placed, practically eliminate mutual inductive and magnetic effects between the elements.

Each element has an independent torque-balancing arrangement consisting of a return plate adjustable by small levers at the side of the grid.

The register, series magnets, series coils, shunt magnets and grids are readily removed for inspection and are interchangeable with the corresponding elements in Sangamo Single-phase Type-H Meters.

Full information regarding the construction and advantages of the Sangamo Type-H Four-wire, Three-phase Watthour Meter will be gladly furnished on request.

SANGAMO ELECTRIC COMPANY

Springfield, Illinois

NEW YORK CHICAGO BIRMINGHAM
SAN FRANCISCO LOS ANGELES

SANGAMO METERS

FOR EVERY ELECTRICAL NEED

6620-1

Hubbard Hardware

Double-Dip Hot Galvanizing Explained

Cleaning

The articles to be galvanized must first be cleaned of all surface scale, rust and other foreign matter. This is done by pickling the articles in a weak solution of sulphuric acid, or they may be cleaned by tumbling or sand blasting.

The Galvanizing Process

After the articles have been cleaned, they are treated with a muriatic acid flux and then dipped in the melted zinc. This zinc is kept at a uniform temperature, which is predetermined according to the size and nature of the articles to be galvanized. The articles are allowed to remain in this zinc until they have reached the same temperature as the molten metal. They are then withdrawn, given a salammoniac flux treatment and re-immersed in the metal. The surface of the metal is then skimmed back clean, the articles removed; given a vigorous shaking or tumbling to remove the excess spelter, and allowed to cool.

The Coating

A study of the coating put on by the hot-dip process shows that it consists of two parts. An outside coating of pure zinc and a layer of zinc-iron alloy, formed by the action of the hot zinc in contact with the iron. The thickness of this zinc-iron alloy and the density of the zinc coating absolutely determine the rust resisting qualities or the life of the coating. And, the bond between the zinc and iron is also governed by the thickness of the zinc-iron alloy, the thicker the alloy, the more firmly the zinc adheres to the iron. Further scientific research has established the principle that the longer the articles remain in contact with the molten zinc, the thicker the alloy formed.

Advantages of the Double-Dip

Since the protective qualities of the coating depend on the density of the coating and the thickness of the zinc-iron alloy, it will be seen that the double-dip process provides both these essential qualities. The action of the second flux, a dry powder, when thrown against the hot articles causes an action which brings to the surface small particles of foreign matter and causes the zinc to flow freely, completely sealing all pores, covering all bare spots, and making a dense non-porous coating. As the articles are given a second dip, the foreign particles brought to the surface are carried away and the thickness of the zinc-iron alloy is increased in proportion to the additional length of time required for the double-dip.

From a scientific standpoint the added value of the double-dip is apparent. From the practical side, twenty years' service on the line is added proof of this process, which has been practiced by Hubbard & Company since entering the line material field, and has had no small part in building up the reputation of Hubbard quality. As long as the only claim for single-dip galvanizing is lower cost, Hubbard & Company will continue its rigid, unvarying use of the double-dip hot process.

HUBBARD & COMPANY

Pittsburgh, Pa.

"Check" Seal

PACIFIC STATES ELECTRIC COMPANY

SAN FRANCISCO, LOS ANGELES, OAKLAND, PORTLAND, SEATTLE, SPOKANE

"Check" Seal

Distributors for the Pacific Coast

ANNOUNCEMENT

With the best interests of our customers in view, the "Three E" Company announces a new representation to cover the entire Pacific Coast.

Clapp & LaMoree, our Los Angeles representatives, have expanded their organization and now have offices in San Francisco, California and in Portland, Oregon. They will also, as soon as arrangements can be made, open an office in Seattle, Washington.

This means that with four offices on the coast, our customers will be assured of prompt and efficient attention to their wants and a service heretofore not obtainable through lack of complete representation.

Write to the nearest office and let them get acquainted with you; tell them your high tension switching and protective requirements and you will be agreeably surprised with their prompt attention.

Equipment and service for the customers' best advantage is our aim and this is another step toward that end.

ELECTRICAL ENGINEERS EQUIPMENT CO.
General Offices: 710 W. Madison St., Chicago, Ill.

Address

Clapp & LaMoree

at the office nearest you

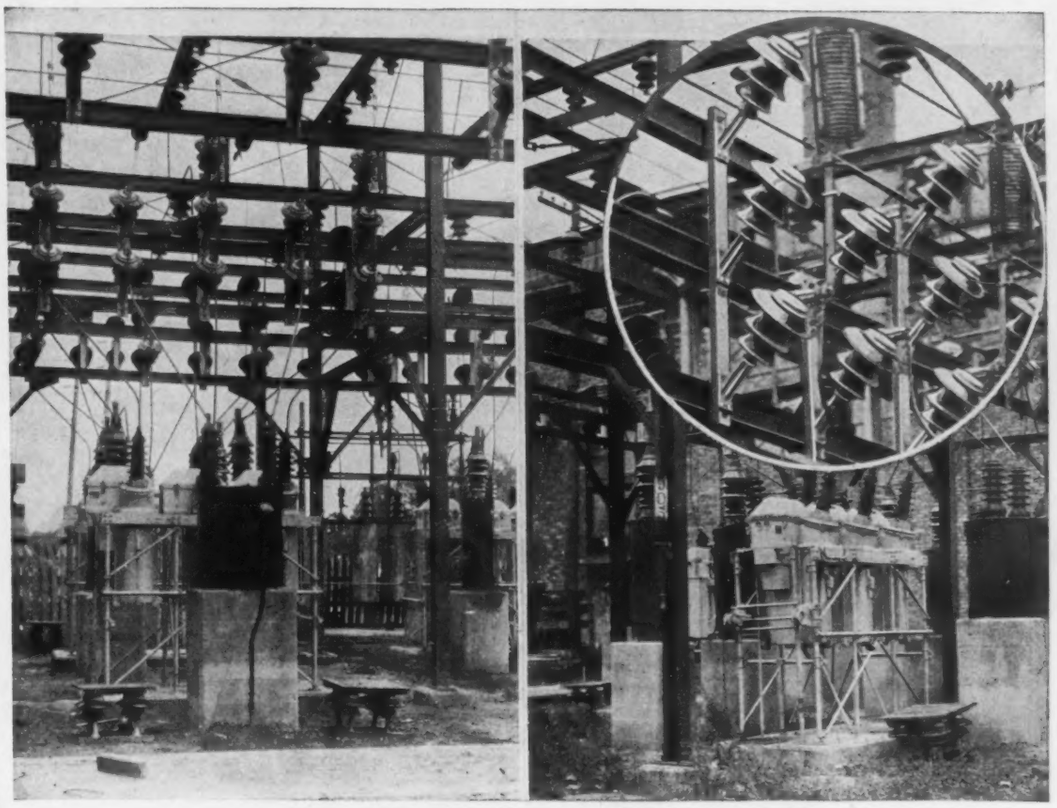
310 E. Fourth St., Los Angeles, Calif.	Electric Bldg., San Francisco, Calif.	Commonwealth Bldg., Portland, Ore.	Seattle, Wash. (address to be announced later)

"THREE E"
HIGH QUALITY
LINE AND STATION EQUIPMENT

THE STANDARD OF COMPARISON

The Delta Star

UNIT TYPE



A "CLOSE-UP" OF DELTA-STAR UNIT TYPE EQUIPMENT

Speaking of **Standards**, the insulators and parts used in this substation assembly are interchangeable with those shipped in 1914.

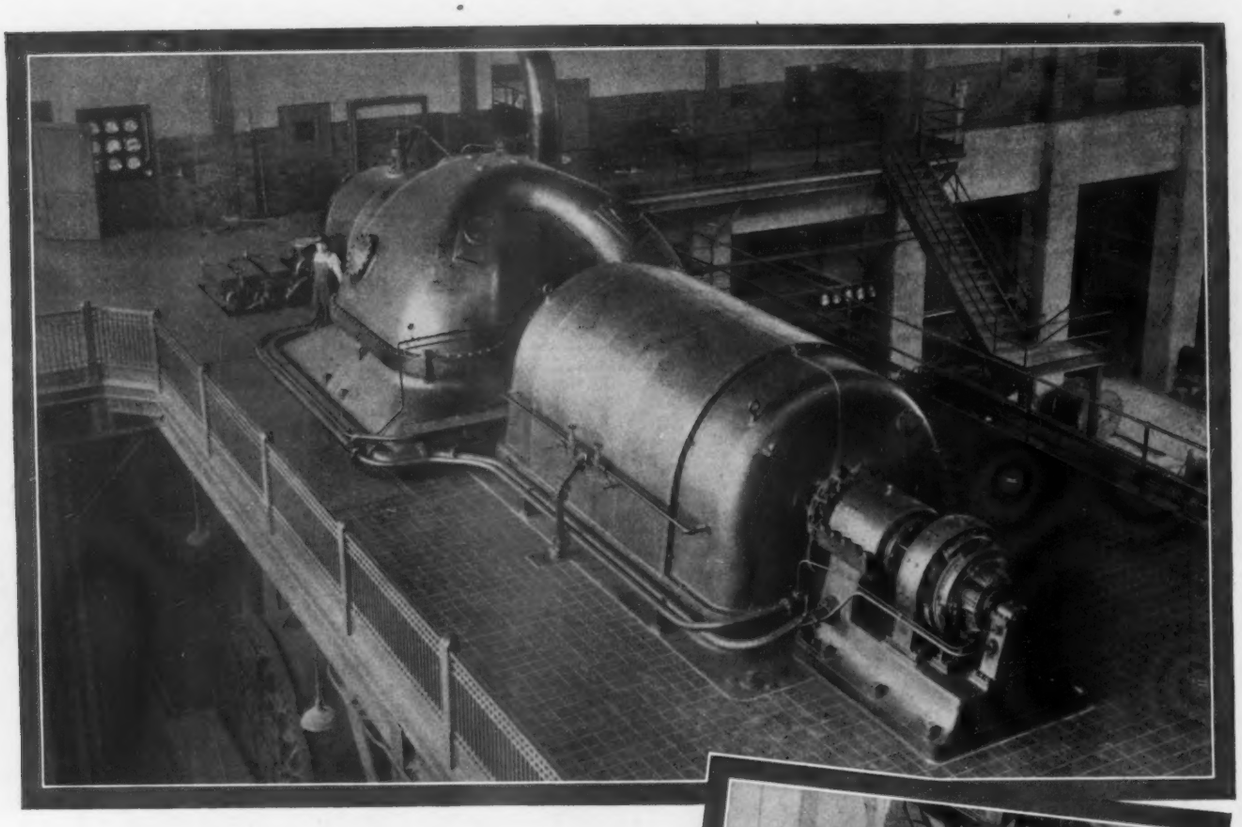
Improvements have been made since 1914—but we never forget to maintain interchangeability.

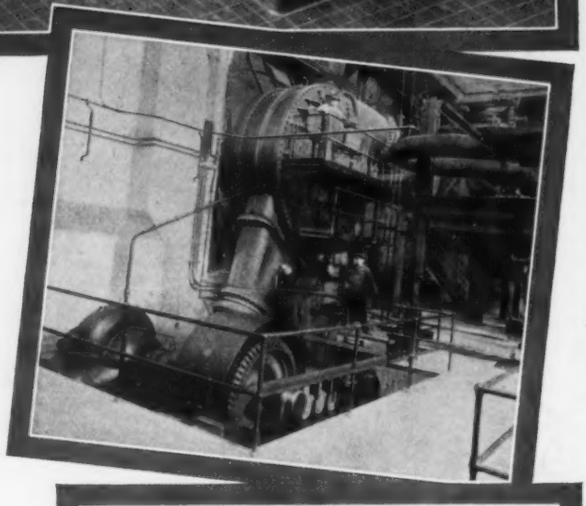
DELTA-STAR ELECTRIC CO.

2400 Block Fulton St Chicago, Illinois

Albany, N. Y., 715 City Savings Bank Bldg.
Birmingham, Ala., 827-830 Brown-Marx Bldg.
Boston, Mass., 294 Washington St.
Buffalo, N. Y., 595 Ellicott Square
Columbus, Ohio, 600 Joyce Realty Bldg.
Detroit, Mich., 708 Ford Bldg.
Indianapolis, 518 Trac. Term. Bldg.
Kansas City, Mo., 301-2 Dwight Bldg.
Knoxville, Tenn., Holston Nat'l Bk. Bldg.
Los Angeles, Calif., I. W. Hellman Bldg.
Minneapolis, Minn., 940 Security Bldg.
New York, N. Y., 25 Broad St.
Orlando, Fla., Cornell-Mathews Co.
Philadelphia, Pa., 1333 Real Estate Trust
Pittsburgh, Pa., 934 Union Trust Bldg.
Rochester, N. Y., 119 Main St., E.
Salt Lake, Utah, 313 Dooly Bldg.
San Francisco, Calif., 193 Second St.
Seattle, Wash., Hoge Bldg.
St. Louis, Mo., Railway Exchange
Syracuse, N. Y., City Bank Bldg.
Toronto, Ont., 213-219 Sterling Rd.
Berthon & Touzot, 40 Rue de Aguisseau, Boulogne-sur-Seine, France
Carrick, Wedderspoon, Ltd., Christchurch, New Zealand
A/S Kraftoverforing Kristiania, Norway
Allenwest, S. A., Ltd., City House, Johannesburg, So. Africa
Allied Engineering Ltd., Sydney, Australia

UNIT TYPE CEMENTED SWITCH INSULATORS





ALLIS-CHALMERS MANUFACTURING COMPANY

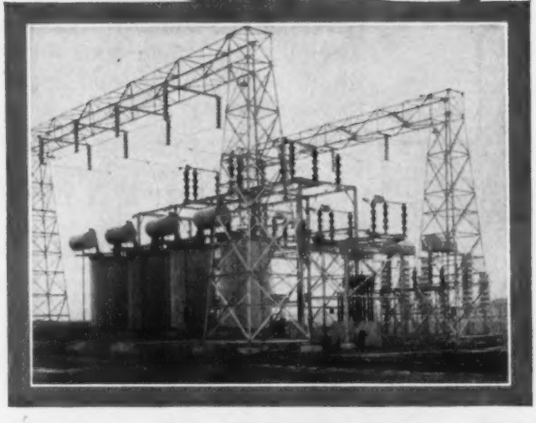
having greatly extended and improved its manufacturing facilities for steam turbine units, particularly of the larger sizes, is now building these units in any commercial size.

The placing in regular service several months ago of the 20,000 K.W., 80% P.F. unit for the Public Service Company of Northern Illinois, as illustrated herewith, will be followed by a 30,000 K.W. unit now building for the same station.

Units ranging in capacity from 20,000 K.W. to 30,000 K.W. are now under construction in the Allis-Chalmers plant.

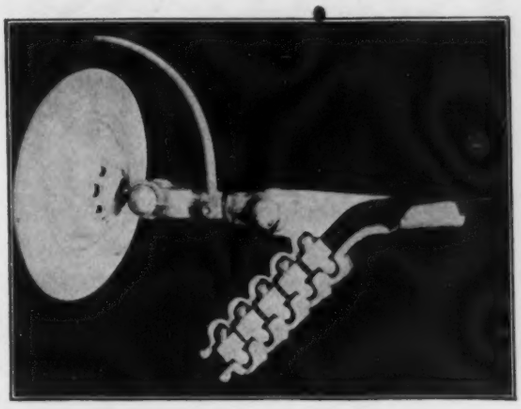
In its more than sixty years of service Allis-Chalmers and its predecessor organizations have successfully built more than eleven million horsepower in steam power equipment.

This organization is at your service in any problem of power equipment.



ALLIS-CHALMERS

MILWAUKEE, WIS. U.S.A.



S-400 Strain Clamp with Horn

C-200 Suspension Clamp with Horn

FORGED STEEL CLAMPS

INSURE UNIFORM QUALITY
AND LONG SERVICE

A JEFFERY-DEWITT PRODUCT

WRITE FOR OUR SPECIAL BULLETIN OF COMPLETE DATA AND PRICES IF YOU ARE INTERESTED IN A
SUPERIOR QUALITY CLAMP

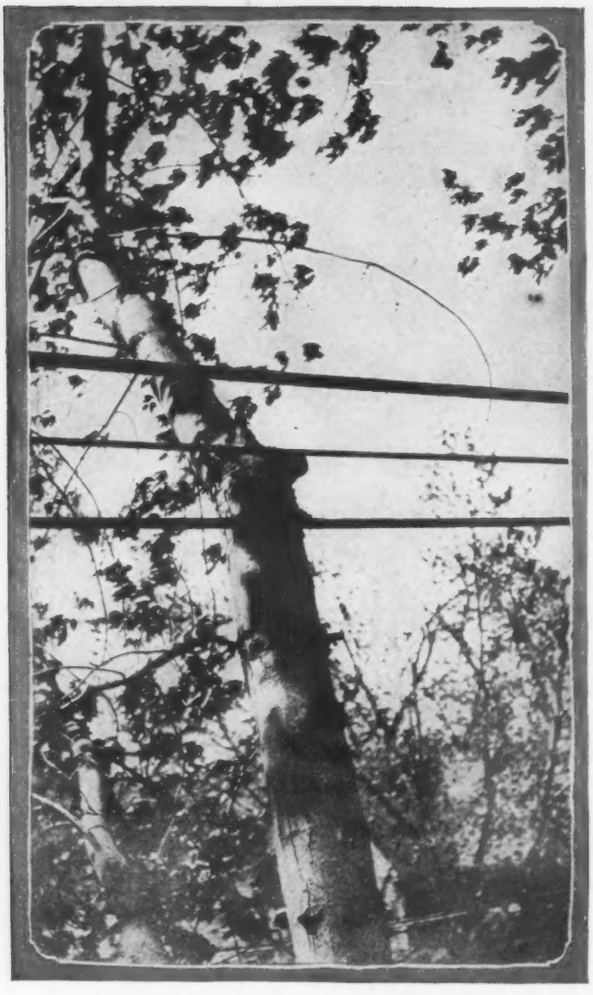
Jeffery-Dewitt Insulator Co.
Kenova, W. Va.

Pacific Coast Representatives:
Garland Affolter Engineering Corporation
Seattle - San Francisco - Los Angeles

Sales Offices in all Principal Cities

JEFFERY DEWITT INSULATOR CO KENOVA, WVA U.S.A.

Overhead or
The Central Sta



FIBREX

Wind, like time is eternal. Down through the centuries, it has been used by mariners, and understood by geologists, scientists and geographers. The action of wind, however, and its effect on the wear of wire, has been recognized only during the past two decades. The constant rub, rub, rub of wire against the limbs of trees is a constant menace. Dead grounds, short circuits and swinging grounds result. Just as wind is the cause of wear on wire, Fibrex tree wire is the solution. Fibrex tree wire is a rubber-insulated copper conductor, protected by a layer of tape, a serving of tarred jute, non-metallic Fibrex armor and a wear-resisting weather-proof braid. This non-metallic armor wears like steel tape—yet has none of its disadvantages.

A 13-Year Record for Fibrex

Fibrex was designed in 1910. The first length of Fibrex ever manufactured was installed early in 1911. After thirteen years of exposure to all kinds of weather, it is still in service. Fibrex has stood the test of time.

The Proof of Fibrex

Scientific analysis of the cause of wear and this specially prepared wire Fibrex is the Simplex Wire & Cable Co's contribution to the electrical industry on this problem. By creating the conditions of wear in our laboratory, we tested No. 6 solid covered with weatherproof braids of 14/2 cotton and found that it lasted through 43,600 abrasions. Fibrex under the same conditions, withstood 1,500,000 abrasions. This indicates that Fibrex will last 35 times longer than No. 6 weatherproof under test conditions.

Every coil of 3000 volt Fibrex is tested for 7500 volts for 5 minutes after soaking 12 hours in water. This test is your assurance that your line men may handle the wire in wet weather with absolute safety.

Fibrex tree wire has been tested and proved. It is made for all commercial voltages. Get a sample and examine it. Sent promptly on request.

Simplex Wire and
Since 1885 we have made insu
201 Devonshire St.,

Underground
tion Problem

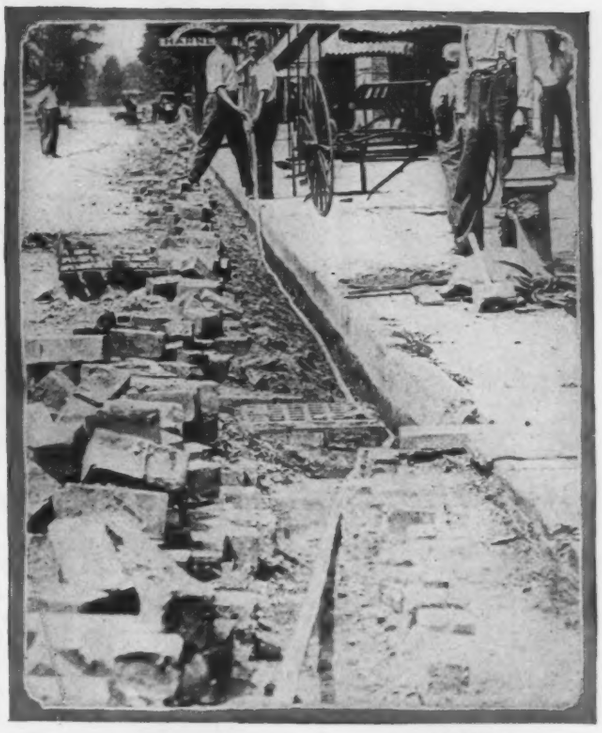
CONDEX

solves the central station distribution problem underground wherever park cable is required. It is ideal on series lighting circuits for municipal street lighting, white way installations, and for park or playground illuminating systems.

It has two advantages over any other cable now manufactured. (1) It is stronger and will stand any pressure that is liable to be placed upon it without spreading. (2) It gives complete coverage. Bend a piece of Condex and you do not spread the steel armor.

The flexible, locked steel conduit is a steel tape applied spirally, around the lead-covered conductor. This steel armor and the unique way in which it is applied form the main distinguishing feature of CONDEX Park Cable. Conduits are unnecessary; manholes need not be constructed and very little digging is required to obtain a satisfactory installation. It can be laid in a shallow trench in the ground, where it is feasible to dig such a trench, or it can be placed under the pavement of a city street by simply removing one course of paving blocks and placing the cable in the bedding under them.

Because of the new arch construction, Condex has many advantages over any other park cable. Condex is stronger. It has complete coverage. Condex is smaller in diameter and lighter in weight, size for size, than any other park cable. It is easier to handle, there is more cable on a reel, it requires less labor to handle the same amount of cable, it costs less to ship by freight and will last longer than any other Park Cable. These are the facts. We should be pleased to have an opportunity of proving them to you.



Coverage

Here is unquestionable proof of complete coverage of Condex Park Cable. This piece of 1-in. diameter Condex was stripped of its outside covering and hammered into a circular form with an average diameter of 3¾ in., an almost unbelievable feat.

Interlocking

This piece of Condex was stripped and then hammered into this form. The cable withstood many heavy blows, which failed to break down or to destroy the interlocking.

Arch Construction

is the strongest possible. This is proved by the fact that arches built centuries ago such as this Saghir arch at Palestine, are still in use.

Cable Company
lated wire for electrical purposes
Boston, Mass.

WHITE COAL IS CHEAP

The eight Smith Hydraulic Turbines at Roosevelt Dam differ in size, but not in principle of effectiveness, from the smaller sizes designed for industrial plants.

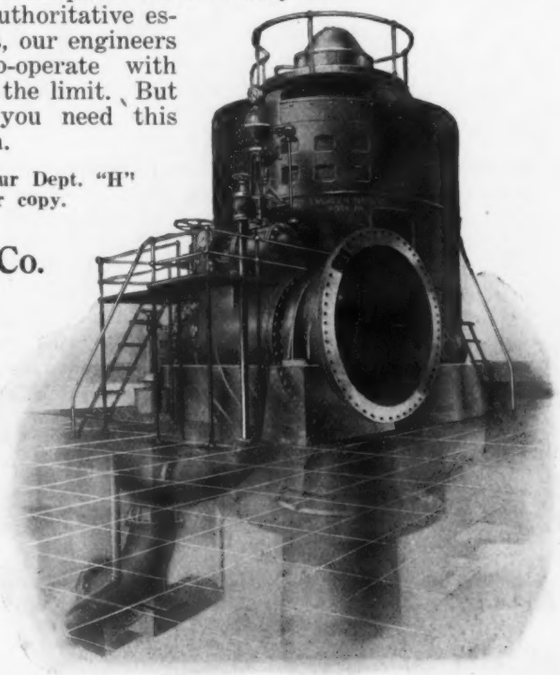
Even the smaller plant frequently reports astonishing success with water-power

Is there an untamed stream somewhere near your plant? Now is the time to investigate its possibilities. As coal rises in cost, and at the same time becomes poorer in quality and uncertain in supply, **White** Coal—water power—offers a great hope.

Even small plants are applying water power to their needs with S. Morgan Smith Turbines. Not only do they save money, but their power supply no longer lies in uncertain outside control. Unaffected by outside conditions, Nature's stream rushes on, providing constant, economical power.

This, above all else, is the one vital question that commands the attention of every forward-looking power plant engineer and executive. To aid you in a preliminary survey, we have prepared a bulletin of designs which points out the vital factors in the use of water power. You will find it an invaluable guide in estimating what a correct water turbine installation should accomplish. Later when you want authoritative estimates, our engineers will co-operate with you to the limit. But today you need this bulletin.

Write our Dept. "H" for your copy.



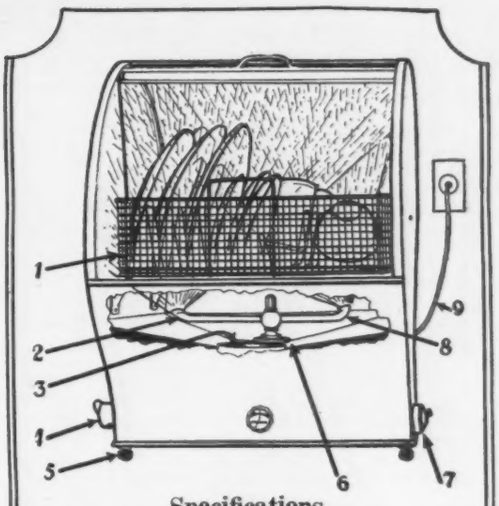
S. Morgan Smith Co.
York, Pa.

S. Morgan Smith Hydraulic Turbines

Dishes washed in two minutes. For the housewife—an hour and a half a day for rest or play.

The machine with the new, practical, efficient, dish-washing principle

MANY features are responsible for the great demand for the Hydro-Lectric — for its superiority and effectiveness. No additional plumbing or wiring is required. It is independent of water pressure. Five quarts of water does the work. It completes the work quickly—washes and rinses in two minutes. Has no soaping device to get out of order—just a teaspoonful of any soap can be used. Absolute sanitation is the rule throughout its construction. Being compact it requires little room when not in use. Guaranteed by manufacturer—thoroughly insulated—lubricates itself through soapy water.



Specifications

1. Dish Rack—Capacity 30 dishes
2. Spray Arm—Outside wash
3. Drain Bowl and Copper Strainer
4. Water Outlet—Right or left drainboard
5. Adjustable Legs—Fits on any sink—rubber tipped
6. Concave Bottom—Insures quick drain
7. Electric Switch—Starts and stops motor
8. Spray Arm—Center wash
9. Electric cord for light socket or plug

Hydro-Electric Manufacturing Co.
Milwaukee, Wisconsin

Western Sales Agencies

HYDRO-LECTRIC SALES AGENCY,
A. A. Guilliaum, Mgr.,
Los Angeles, Calif.

SLOAT WHOLESALE CO.,
Portland, Ore.

HYDRO-ELECTRIC MANUFACTURING CO.
HYDRO-LECTRIC
PAT. PEND.
DISHWASHER
MILWAUKEE, WISCONSIN

No Power Shortage— A Great Achievement

WITH pride, this Company announces that the perplexing problems presented by the long drought have been solved.

There will be no shortage of power in P. G. and E. territory this year.

All demands for electricity have been met. An increased consumption of approximately twelve per cent has been supplied. Nor will rates be increased.

Behind this simple announcement lies the story of a titanic struggle by a loyal and efficient organization against appalling odds; a fight that was fought and won in silence for a public unaware that it was going on.

California's homes, industries and irrigation depend much on electric power. California uses more electricity per capita than any other state. In terms of wealth and comfort, therefore a shortage of electricity is a serious matter to us all.

Electricity in this state is made primarily by turning a wheel with falling water. Thus fuel is saved. Steam plants, much costlier to operate because they burn oil, are maintained as auxiliaries. So, a water shortage naturally implies a power shortage and higher rates.

For eight years rainfall in California has been below normal, and in 1923-24 the seasonal precipitation was only forty per cent of normal. Stored water in the principal reservoirs north of Tehachapi attained only fifty per cent of reservoir capacity.

When January passed with the drought unbroken the P. G. and E. tackled the problem of making sure of a continuous, adequate service. For weeks the Company's intrepid scouts tramped the remote Sierras on snowshoes measuring the depth and density of what snow there was. Before the Company's engineers was the sceptre of the summer's peak demand: the haunting fear that a day would come when factories, mines, farms, railways, stores and homes would be pulling on the lines together and would fail to find enough "juice" for all.

"Conserve water, and bring up steam production; work the steam stand-bys day and night, and get new steam power wherever possible" was the order, to which was added: "Cut operating costs to the minimum in order to meet the increased expense for fuel oil."

By a myriad of ingenuities and new contrivances every drop of stored water has been made to do unprecedented duty in power-production. A great steam plant, costing a million dollars, authorized January 31st, was completed and in service June 16th, a month ahead of schedule. Industrial steam-plants like those of the California Hawaiian Sugar Refinery, Mare Island Navy Yard, Northwestern Pacific Railroad, and the Hercules Powder Company, and plants disused because power bought from the Company is cheaper, were leased by the P. G. and E., oiled, and set to making current. In January the Company had 27 hydro and 5 steam plants. In September it was operating 42 plants. Cost of oil consumed leaped up three million dollars, but rigid economy in other directions held down the increase in cost of power-production so that no increase in rates will be made.

Luck was not kinder than usual. At a critical time, 144 feet of the Stanislaus flume, perched on a trestle 40 feet high, went out, and the break, 15 miles from the base of supplies, shut down a plant of 50,000 horsepower. This flume is 6 feet deep and 9 feet wide, one of the greatest in America. Shifts of heroic toilers made the repairs in 62 hours although the job was estimated to take 96.

At steam plants boiler troubles occur. Repairs ordinarily mean a stop of three days for it takes 24 hours for the interior to cool. In a particular instance a boiler was repaired in 22 hours. Some one went into that torrid boiler and removed the heated brick lining. It was all in the day's work.

Other setbacks occurred such as the prevalence of forest fires, damaging power lines and flumes, but the Company has met the requirements of the public without requesting help or favor. When new consumers asked for service they got it without a murmur. The farmer, who needed more power than ever before, was not denied. No new industry failed to get energy. The twelve per cent increase in demand for power was supplied with a smile, although there were whiles when the engineers felt a palpitation of the heart every time a stout passenger boarded a streetcar on the system.

And now, Victory. The farmer's pumping is done. The strain relaxes. We will fight tomorrow's battles with tomorrow's strength; but rain or shine the mighty Pit No. 3 will come in next season and the Company has no fear of the year ahead.

Contributing to that victory, a victory of which the public get all the fruits, was, first, a devoted and efficient organization, comprising 11,600 employes, always on their toes, guided by initiative and foresight, ambitious to maintain the unfailing standards of Pacific Service.

Then the fact that the P. G. and E., one of the largest hydro-electric companies in the United States, serves a wide territory, drawing power from numerous sources, favored by a great diversity of demand. No single plant, serving one community, could have met the situation.

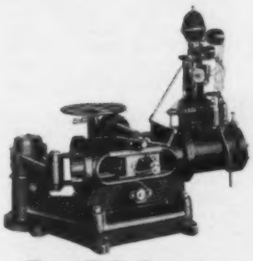
Finally, the spirit of co-operation among the power companies of California who, for the sake of the public service, fed one another from time to time with surplus power, as the load here fell off, and the load there pressed harder, so that not a kilowatt of current went to waste.

When you think of the Pacific Gas and Electric Company, picture a company with 11,600 employes and 30,000 owners, nearly all Californians—a company, serving the public faithfully and on the job in all seasons and at all hours.

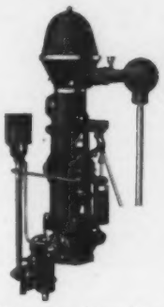
PACIFIC GAS AND ELECRTIC COMPANY

35-1024

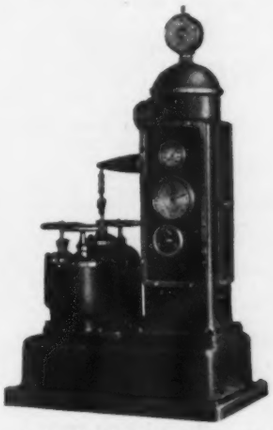
Success in a Unique Field



Type H-R Governor with motor driven governor head



Remote Starting Mechanism for automatic hydro-electric plants



Actuator Type Governor for large turbines

With the growth and development in the hydro-electric field, Woodward water wheel governors have completely demonstrated their advantages and brought about economical hydro-electric plant operation. In many cases these governors were potent factors in the development of water power.

The name Woodward has, for more than five decades past, been identified with water wheel governors. That Woodward governors have reached their present high state of refinement and efficiency is due to the constant effort and close application to this unique problem.

The compensating type mechanical governor was one of the early Woodward inventions and has afforded very satisfactory speed regulation in thousands of small and medium size plants, and is still in some demand for certain installations. This particular type happens to be the only small successful, quick-acting mechanical governor ever produced.

Fifteen years ago the Woodward oil pressure governor was placed on the market. This governor is now obtainable in types and sizes to suit the installation and also the actuator type governor for large hydro-electric units.

The measure of success attained by Woodward governors is again evidenced by the development and perfection of the following:

The remote or automatic starting mechanism for full or partly automatic non-attendant hydro-electric plants. The motor driven governor head, rapidly supplanting the belt drive. The pneumatic control to adjust the load according to the water available, although the pond may be located a considerable distance away. The motor operated load limit device for remotely controlling the gate opening.

Step by step, anticipating the requirements, today there are Woodward governors to provide for every hydro-electric power plant requirement.

WOODWARD GOVERNOR CO., Rockford, Illinois

WOODWARD

Water Wheel Governor

STALEY, EARL B. CO., 1002 E. Seneca St., Seattle——Mead-Morrison truck winches and cranes.

STANDARD BRASS MFG. CO., 1044 S. Los Angeles St., Los Angeles——Guth ltg. equip.

STEWART ELEC. CO., 912 Post St., Seattle, Wash.——Robbins & Myers motors.

STEWART WHOLESALE CO., Boise, Idaho——Maytag washers.

SUTCLIFFE, PAUL, 400 San Fernando Bldg., Los Angeles——Adams Morgan Co.

SUTOR & CO., 1315 E. 7th St., Los Angeles——Magnetic Mfg. Co.; Pittsburgh Elec. Furnace Corp.

SQUARE D CO., 236 Rialto Bldg., San Francisco, E. S. Conrad, Mgr.; 717 Lafayette Park Place, Los Angeles, H. T. Titus; Seattle, H. R. Drew——Square D Switches.

STANDARD UNDERGROUND CABLE CO., San Francisco, Los Angeles, Seattle, Salt Lake city——Factory in Emeryville.

STAR MACHINERY CO., 1735 First Ave. South, Seattle——Valley Electric Co.

STARE, BURTON R., CO., 325 Yesler Way, Seattle——Packard transformers; Sangamo meters; Electric Service Supplies Co.; Ideal Commutator Dresser Co.; Duplex-a-Lites.

STEARNS-ROGER MFG. CO., 1720 Calif. St., Denver——Spray cooling ponds; Coppus power plant equipment.

STEBBINS - ROBERTS - BUQUOR CO., H. Y. Stebbins, 1323 S. Flower St., Los Angeles——Commercial Truck Co.

STENGER & BERLINER, 1417—4th St., Seattle——Racine electric hair cutter and hair dryer; Shelton Elec. Co., Solar apparatus.

STERLING & HARKNESS, 311 California St., San Francisco——Eagle elec'l specialties; A-A Wire Co.

STEVENS, S. S., 134 W. 2nd So. St., Salt Lake City——Century electric motors.

STEWART, CHAS. G. CO., Tacoma, Wash.—Apfel elec. heaters.

STEWART ELEC'L MFG. CO., 59 Columbia Square, San Francisco ——Stewart switchboards & panel boards.

STONE & WEBSTER, INC., 301 Holbrook Bldg., San Francisco ——Construction engineers.

STRIMPLE & GILLETTE, Seattle, Portland, Spokane——Anylite Elec. Co.; Chicago Flexible Shaft Co.; E. H. Freeman Elec. Co.; Horton Mfg. Co.; Wilmington Fibre Specialty Co.; Bedford Lamp Wks.; Trenton Porcelain Co.; N. J. & Elec. Material Co.; Jacobs Mfg. Co.

STUBBS ELEC. CO., 6th and Oak Sts., Portland —— Edison Mazda lamps; Majestic heaters; Bryant wiring devices; Simplex wires & cables; Edison Elec. Appl. Co.; Everhot water heaters; Hamilton-Beach appliances; Remler radio apparatus; A-F water heaters, General radio apparatus.

STURTEVANT, THE B. F. CO., San Francisco, Los Angeles, Seattle, Portland, Salt Lake City.

SUTTHOFF, J. H., L. C. Smith Bldg., Seattle—Rawlplugs.

SWARTZ, Wm. P., 2520 W. 7th St., Los Angeles——Standard elec. stoves.

SWEENEY, B. K. ELEC. CO., 13th Ave. & Broadway, Denver——Thor laundry equipment; Hubbell devices; Automotive supplies; N. Y. ins. wire; Weston electrical instruments; Garland Mfg. Co.; Hart Mfg. Co.; Alphaduct Co.; Pratt Chuck Co.; Columbia Lamp Div.; Ansonia Elec'l Co.

SWETT, G. E., Rialto Bldg., San Francisco —— Carlisle & Finch searchlight projectors.

SWEYD, M., Furniture Exchange, San Francisco——Lionel Electric Corp.

TANNER, F. A., 77 O'Farrell St., San Francisco, Western Sales Representative——"Kent Vacuna" cleaners.

TARO, W. A. CO., Everett, Wash. ——Grether Fire Equip. Co.

TEATS, C. M., Metropolitan Bldg., Los Angeles——Frink ltg. specialties.

TERRY STEAM TURBINE CO., 1070 Folsom St., San Francisco; 316 American Bank Bldg., Los Angeles——Terry steam turbines.

THEBO, STARR & ANDERTON, INC., Sharon Bldg., San Francisco and Fresno——Construction engineers.

THOMAS, H. M. CO., 589 Howard St., San Francisco——Schweitzer & Conrad, Inc.

THOMAS, S. F., 1207 Hearst Bldg., San Francisco——Automatic refrigerating apparatus.

THOMAS MACHINERY CO., 316 American Bank Bldg., Los Angeles——Kimble motors; Kuhlman transformers; E. C. & M. control equipt.; Terry turbines; Jewell instruments; Bartlett - Hayward flexible couplings; Elec. Machinery Mfg. Co.; "Cash" valves.

THOMSON DIGGS CO., Sacramento, Calif.——Chisholm-Moore Mfg. Co.; Universal elec. appliances.

THOR ELECTRIC SHOPS, San Francisco, Oakland, Los Angeles, Portland, Seattle——Hurley Thor cleaners.

TIDEWATER CROSSARM & CONDUIT CO., Tacoma——American Crossarm & Conduit Co.

TILLOTSON, R. P. & CO., 229 So. San Pedro St., Los Angeles——Appleton Elec. Co.; Ajax Elec. Specialties; Appleton Rubber Co.; Aurora Steel Products Co.; Short Mfg. Co.; Steelduct Co.

TINDOLPH CO., 5539 White-Henry Stuart Bldg., Seattle——Stuebing lift trucks; Yale & Towne Mfg. Co.; The Towmotor Co.; Grand Rapids Veneer Works.

TRAYLOR ENG'G. & MFG. CO., I. W. Hellman Bldg., Los Angeles, H. V. Croll, Dist. Mgr.; 815 Alaska Bldg., Seattle, W. H. Agens, Dist. Mgr.——Traylor motor trucks, crushers & machinery.

TRINITY SALES CO., 336 So. Broadway, Los Angeles——Faultless washers.

TRITCH HDWE. CO., Bank Bldg., Denver——Plymouth rope; Horton washers; Bee-Vac cleaners.

TRIUMPH ELECTRIC CO., 1310 Seattle Blvd., Seattle——Triumph motors.

TRUMBULL ELEC. MFG. CO., 595 Mission St., San Francisco—— Circle T switches.

TRUSCON STEEL CO., San Francisco, Los Angeles, Seattle, Salt Lake City——Truscon Steel poles.

TURNBULL, L. W., & CO., 1422 16th St., Denver——Micabond insulation.

TURNER, WM. S., & CO., Spalding Bldg., Portland——Heine boilers; De Laval turbines and pumps; Wheeler condensers; Leffel water wheels; Warren Webster heating specialties; Patterson-Kenly feed water heaters; American Blower Co. ventilating equipment.

TYLER, H. D. CO., INC., THE, 512 Pacific Bldg., San Francisco ——Westwyre radio products.

UNION IRON WORKS OF LOS ANGELES, Los Angeles——Shepard cranes & hoists.

UNION HARDWARE & METAL CO., 411 E. 1st St., Los Angeles ——Templeton Kenly jacks; Universal line; Fada & Brandes radio apparatus; Red Seal products; Sunray lamps; Robbins & Myers fans; Aerobell elec. washers; Polar Cub heaters, vibrators, hair dryers & fans; Hamilton Beach products.

UNITED ELEC. SUPPLY CO., 31 W. 4th So., Salt Lake City—— Russell elec. appliances.

UNITED VACUUM CLEANER STORES, Fresno, Calif.——Sunshine electric cleaners.

UNITED STATES ELEC. CO., 710 Polk St., San Francisco——Anylite products; Greist Mfg. Co.; Rogers Elec'l Lab. Co.; Vita Elec. Co.; Forman & Co.

U. S. ELECTRICAL MFG. CO., San Francisco, Los Angeles—— U. S. Motors.

U. S. GRAPHITE CO., San Francisco, Denver.

U. S. LIGHT & HEAT CORP'N., 873 Monadnock Bldg., San Francisco, Geo. P. Wray, Dist. Mgr. ——U. S. Lt. & Heat Corp'n.

U. S. RUBBER CO., Los Angeles, San Francisco, Seattle, Portland, Spokane——Paracore wire.

U. S. STEEL PRODUCTS CO., San Francisco, Los Angeles, Portland, Seattle——National Tube Co.

UNIVERSAL ELEC. CO., 137—5th St., San Francisco —— Simplex Elec. heating appliances.

UTAH ELEC. & MOTOR EQUIP. CO., 37 E. 1st S., Salt Lake City, Utah——Guth ltg. equip.

VALLEY ELEC. CO., 429 Rialto Bldg., San Francisco, W. Veit—— Valley Elec. Co.

VAUGHAN, H. L., U.S. Nat. Bank Bldg., Denver——Cutler-Hammer control devices; Crocker-Wheeler motors.

VOITLE, R. B., 609 Gillette Bldg., San Francisco —— Heinemann porcelain cutouts; Jefferson illum. glassware & portable lamps.

VOORHEES, R. E., L. C. Smith Bldg., Seattle——Burton-Rogers & Hoyt instruments.

VOLKER, WM. & CO., San Francisco, Los Angeles, Portland—— Bee-Vac cleaners.

WAAGE ELEC. CO., 1622 W 16th St., Los Angeles——Waage elec'l household appliances.

WAGNER ELEC. CORP'N., San Francisco, Los Angeles, Seattle, Salt Lake City, Denver, Portland ——Wagner single & polyphase alternating current motors, distribution & power transformers.

WALKER ELEC. CO., Boise—— Meadowlark washers; Grand ironers.

WARD, FRED, & SON, 170 First St., San Francisco —— Dumore grinders; Cincinnati elect. drills; General Electric motors.

WARNER, L. C. CO., Seattle, Portland, San Francisco —— Savage washer and dryer; radio supplies.

WASHINGTON ELEC. SUP. CO., S. 152 Monroe St., Spokane—— Westinghouse Elec. & Mfg. Co.; Westinghouse Mazda lamps; Hurley Machine Co.; Anaconda wire; Condulets; George Cutter Works; Noark fuses, cutouts; P. & S. wiring devices; Bryant wiring devices; Square D. switches; Johns-Manville elec'l products; Leach Co.; A & F water heaters, utility tanks, Fibreform tank covers; Universal appliances; Paranite wire; Economy fuses; Williamson fixtures; General radio apparatus; Hold Heet appliances; Radio Corp. of America.

WASHINGTON ENG'G SALES CO., Pioneer Bldg., Seattle—— Northern Electric cranes.

WATER WORKS SUPPLY CO., Call Bldg., San Francisco, C. B. Abbott, President —— Rennselaer electrically operated gate valves.

WATKINS, H. F., Co., Hansford Bldg., San Francisco——Triumph motors.

WATSON, C. J. E., Call Bldg., San Francisco, Western Sales Representative——Universal line.

WATTS, B. C. & CO., 407—14th St., Denver——Arrow Elec. devices; Rome wire; Chicago Fuse outlets; iron conduit; Nat'l Metal Moulding.

WAYNE TANK & PUMP CO., 430-4th St., San Francisco, Gale Strout——Wayne Tank & Pump Pump Co.

WELDING SERVICE & SUPPLY CO., 559 Howard St., San Francisco——Manganese Steel Forge Co. welding rods.

WELLS MFG. CO., 673 Folsom St., San Francisco——Wells elec. irons & motor starting switches.

WELLMAN - SEAVER - MORGAN CO., THE, Rialto Bldg., San Francisco, Norman Ross, Mgr. ——Water wheels and turbines.

WELSBACH CO., 863 Mission St., San Francisco —— Conlon washers.

WEST COAST SALES AGENCIES, 760 Market St., San Francisco, H. C. Hopkins——Haag washers.

WESCO, THE, CO., INC., 1160—7th St., Denver——Illinois porcelain insulators; Steel City elec'l specialties; U. S. Rubber Co.; Trumbull-Vanderpoel switches; Danbury elec. push buttons; Interstate Brass Co. bus bar copper; Stanley & Patterson signal apparatus; Heinemann porcelain cutouts; "Saylorduct" loom; "Pittsburgh Standard" conduit.

WESTERN AGENCIES CO., San Francisco, Los Angeles, Seattle ——Williamson ltg. fixtures; Pal-O-Mine & New Liberty washers; Framburg ltg. fixtures; Wolcott curling irons.

WESTERN ELEC. CO., all principal cities——Western Electric washers, ironers, cleaners, sewing machines, ranges & hot plates, lamps, motors power apparatus, power & light outfits, ltg. units & water pressure systems; Aetna Rubber Co.; American Crossarm & Conduit Co.; American Elec. Heater Co.; Bermo Fibre Conduit; Indiana Steel & Wire Co.; Hamilton-Beach Co.; Mathias Klein & Son; Majestic Elec. Appliance Co.; Memco splicing sleeves; National Fibre Co.; National Pole Co.; National Carbon Co.; Wesix elec. water heaters; Benjamin reflectors, panel boards; Square D switches; Faraday bells, alarms; Brascolites, Aglites; Habirshaw wire; Sunbeam Mazda lamps; Economy renewable fuses; Sheraduct conduit, Flextube; X-ray reflectors; D. & W. enclosed fuses; Crouse-Hinds Co.; Bryant Elec. Co.; Edwards & Co., Inc.; Thomas link type insulators; Buhrke leather, canvas goods; Simplex pole jacks; Oshkosh linemen's tools; Manning-Bowman hollow ware; Hemingray glass; Hubbard & Co.; King "White Way" posts; Templeton-Kenly jacks; Weston electrical instruments; Jefferson elec. transformers & automotive equip.; A-F elec. water heaters; Cope elec'l tools & equip.; Federal sirens, lanterns & National fuses; Red Spot ltg. specialties; "American Brand" wire.

WESTERN HARDWARE CO., Butte——Save Electric Corp.

WESTERN LT. & FIXTURE CO., 301 So. Los Angeles St., Los Angeles——Eveready flashlights; G. I. Mazda lamps; Hotpoint heating devices; Macbeth-Evans glassware; P. & S. wiring devices; Virden fixtures; Overbagh & Ayres Mfg. Co.

WESTERN RADIO, INC., 1224 Wall St., Los Angeles——Jobbers of radio supplies.

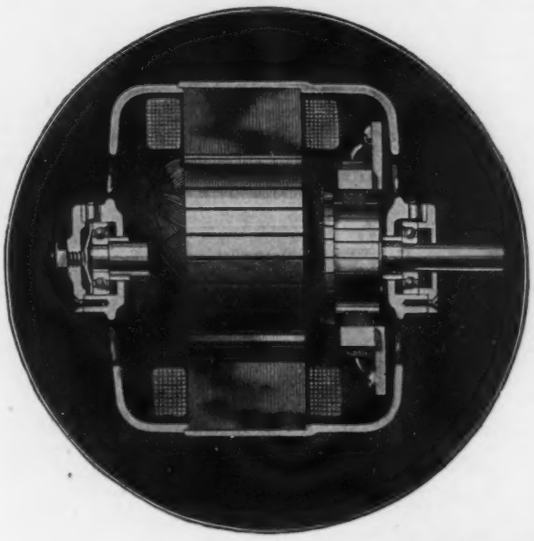
WESTERN SAFETY MFG. CO., 247 Minna St., San Francisco—— "Westest" safety switches, panel boards & cut-out boxes.

WESTCOTT & GREIS, INC., 1960 Santa Fe Ave., Los Angeles—— Davis regulators.

WESTINGHOUSE ELEC. & MFG. CO., San Francisco, Los Angeles, Fresno, Portland, Seattle, Spokane, Tacoma, Salt Lake City, Butte, Denver, El Paso, Tucson.

WHITE SEWING MACHINE CO., 512—2nd St., San Francisco, Los Angeles, San Jose, Oakland, Long Beach, Riverside, San Diego, Tacoma, Spokane, Bellingham, Portland, Seattle, Salt Lake City, Denver——White Sewing Machine Co.

Much of Your Servicing Expense Is Needless and Can Be Prevented



You know, from your own experience, that "bearing troubles" lie at the root of most of the free servicing you have to give, on the motored household utilities and vacuum cleaners that you sell. And you know, also from experience, that most of these troubles come from the buyer's failure to oil the bearings, or the use of the wrong kind of oil. Evidently all these troubles would be avoided, and your servicing expenses saved, if these "bearing troubles" were eliminated—as they can be.

For Fractional H. P. Motors

"NORMA" PRECISION BALL BEARINGS

For Vacuum Cleaner Motors

It is a fact of experience—known to manufacturers of fractional Hp. motors and vacuum cleaners—that "NORMA" Precision Ball Bearings eliminate motor bearing troubles due to neglected or improper oiling—because they provide within their housings lubricant ample for months of service without renewal or attention. And—in addition to this pre-eminent advantage—these motors and cleaners last longer, do more and better work, use less current, cost less to run, sell more easily, stay sold.

Have the motored utilities and vacuum cleaners you sell, "NORMA" equipped motors?

NORMA-HOFFMANN BEARINGS CORPORATION

Anable Avenue Long Island City New York

PRECISION BALL, ROLLER AND THRUST BEARINGS

KUHLMAN ELEC. CO., Bay City, Mich.——Thomas Machinery Co., Los Angeles; C. F. Henderson, San Francisco; Equipment Sales Co., Seattle; Austin Henderson Co., Spokane.

KULP THEFT PROOF LAMP CO., Chicago——Stephen Smith & Co., San Francisco.

LAKEWOOD ENGINEERING CO., Cleveland——Eng'g Products Co., San Francisco; Spencer & Morris, Los Angeles; Clyde Equip. Co., Portland, Seattle, Spokane.

LANDERS, FRARY & CLARK, New Britain, Conn.——Herbert A. Cram, Western Sales Representative, San Francisco; Elec. Appliance Co., Baker, Hamilton & Pacific Co., Dunham, Carrigan & Hayden, Heyman-Weil, San Francisco; Thomson-Diggs Co., Sacramento; Elec. Corp., Union Hdwe. & Metal Co., Calif. Hdwe. Co., Los Angeles; Elec. Corp., Marshall-Wells Co., Honeyman Hdwe. Co., M. Seller & Co., Portland; Elec. Corp., Seattle Hdwe. Co., Schwabacher Hdwe. Co., M. Seller & Co., Seattle; Washington Elec. Supply Co., Marshall-Wells Hdwe. Co., Holley-Mason Hdwe. Co., Spokane; Strevell-Paterson Hdwe. Co., Intermountain Elec. Co., Salt Lake City; Moore-Bird Co., New England Elec. Co., Denver; Montana Elec. Co., Butte; Ariz. Hdwe. & Supply Co., Phoenix; Holmes Hdwe. Co., Pueblo, Colo.

LAPP INSULATOR CO., INC., LeRoy, N. Y.——S. Herbert Lanyon, San Francisco; O. H. Davidson Equip. Co., Denver; Hugh G. Purcell, Seattle.

LARNER ENG'G CO., Philadelphia ——Pelton Water Wheel Co., San Francisco.

LAUNDRYETTE MFG. CO., Cleveland——Hendrie & Bolthoff Mfg. & Supply Co., Denver; Ivan L. deJongh, Los Angeles; W. L. Cochrane, Inc., San Francisco; Modern Appliance Co., Seattle.

LEACH CO., Oshkosh, Wis.—— B. C. Holst, Pacific Coast Representative, San Francisco; Pacific States Elec. Co., Los Angeles, Oakland, Portland, San Francisco, Seattle, Spokane; Western Elec. Co., all principal cities; Fobes Supply Co., San Francisco, Portland, Seattle; North Coast Elec. Co., Seattle, Portland, Spokane, Tacoma; Washington Electrical Supply Co., Spokane; Dunham Carrigan & Hayden Co., San Francisco; Baker, Hamilton & Pac. Co., San Francisco; Baker-Joslyn Co., San Francisco, Los Angeles, Seattle.

LEE ELEC. & MFG. CO., San Francisco——Lemco radio equipment.

LEEDS & NORTHRUP CO., Philadelphia, Pa.——J. H. Knapp, Los Angeles.

LEES, K. F. CO., New Haven, Conn.——

LEFFEL, JAMES, & CO., Springfield, O.——Harron, Rickard & McCone, San Francisco.

LEPTAK FIRE-BRICK ARCH CO., Chicago, Ill.——Oliver B. Lyman, San Francisco; Eicher & Bratt, Seattle.

LEUPOLD, VOELPEL & CO., Portland——Dieterich Post Co., San Francisco; McKinney Blueprint Paper Co., Los Angeles.

LIBERTY GAUGE & INSTRUMENT CO., Cleveland, O.—— Pacific Coast Office, Los Angeles.

LINCOLN ELEC. CO., Cleveland ——Smith-Booth-Usher Co., San Francisco, Los Angeles; E. H. Albrecht Co., Portland.

LINDSLEY BROS. CO., Spokane, Wash.——Baker-Joslyn Co., San Francisco, Los Angeles, Seattle.

LINE EQUIP. SALES CO., Cleveland, —— Maydwell & Hartzell, Inc., San Francisco, Los Angeles.

LINE MATERIAL CO., S. Milwaukee, Wis.——Line Material Co., A. L. Dunmire, Oakland; W. W. Kirk, Los Angeles, Portland.

LINK-BELT CO., Chicago—— Western Offices, San Francisco, Los Angeles, Portland, Seattle.

LIONEL CORP., THE, New York, N. Y.—M. Sweyd, San Francisco, District Representative; Reiman Wholesale Elec. Co., Los Angeles; Cardinell-Vincent Co., Holtermann's Elec. Shop, San Francisco.

LUPTON'S, DAVID, SONS CO., Philadelphia——F. T. Crowe & Co., Seattle, Tacoma.

LOCKE INSULATOR CORP., Victor, N. Y.——Pacific States Elec. Co., Los Angeles, Oakland, Portland, San Francisco, Seattle, Spokane; Capital Electric Co., Salt Lake City.

LOCOMOTIVE ELECTRIC WASH. MACH. CO., Belleville, Ill.—— Nathan, Dohrmann Co., San Francisco.

LOGEMANN BROS. CO., Milwaukee, Wis.——Mailler Searles, Inc., San Francisco.

LOUDEN MACHY. CO., Fairfield, Ia.——Northwest Appliances, Inc., Portland.

LUMINOUS UNIT CO., St. Louis ——Butte Elec. Supply Co., Butte; Western Elec. Co., principal cities.

LYNCHBURG GLASS CORP., Lynchburg, Va. —— Baker-Joslyn Co., San Francisco, Los Angeles, Seattle.

McALEAR MFG. CO., Chicago—— C. H. Cobb, San Francisco; Specialty Supply Co., Portland; Neilan Valve & Supply Co., Los Angeles; C. L. Williamson, Seattle.

McALLISTER, W. B. CO., Cleveland, O.——Holbrook, Merrill & Stetson, San Francisco.

McCLINTIC-MARSHALL CO., Pittsburgh, Pa. —— McClintic-Marshall Co., San Francisco, Seattle; Irving Gottheim, San Francisco; W. B. Kyle, Los Angeles; Hugh G. Purcell, Seattle.

McFADDEN, H. G., & CO., New York City——Western Jobbers.

McGILL MFG. CO., Valparaiso, Ind. ——J. G. Pomeroy, Los Angeles & San Francisco.

McKAY CO., New York City—— Atlantic-Pacific Agencies Corp., San Francisco, Los Angeles, Portland.

McKINNEY MFG. CO., Pittsburgh, Pa.——Mailler Searles, Inc., San Francisco; John F. Willard, Los Angeles; W. R. Hendrey Co., Seattle.

McMYLER INTERSTATE, CO. Bedford, Ohio——McMyler Interstate Co., San Francisco; Lidgerwood Mfg. Co., Los Angeles.

MACBETH-EVANS GLASS CO., Pittsburgh, Pa.——S. A. Baker, Pacific Coast Mgr., San Francisco; Poindexter Supply Co., Denver; C. M. McIntosh, Denver.

MAGEE FURNACE CO., Boston ——T. G. Arrowsmith Co., San Francisco.

MAGNAVOX, THE CO., Oakland, Calif.——Sales Offices, New York, Chicago, San Francisco.

MAGNETIC MFG. CO., Milwaukee, Wis.——A. S. Lindstrom, San Francisco; Sutor & Co., Los Angeles; Riser-Merry Co., Salt Lake City; H. A. Killam, Portland.

MAJESTIC ELEC. APPLIANCE CO., San Francisco——Holbrook, Merrill & Stetson, San Francisco, Los Angeles; Schwabacher Hdwe. Co., Seattle; and other jobbers.

MANGANESE STEEL FORGE CO., Philadelphia, Pa.——Welding Service & Supply Co., San Francisco; W. Montelius Price Co., Seattle.

MANHATTAN ELEC'L SUPPLY CO., Inc., New York, Chicago, St. Louis——Manhattan Elec'l Supply Co., Inc., San Francisco.

MANNING, BOWMAN & CO., Meriden, Conn.——Manning, Bowman & Co., San Francisco; Hendrie & Bolthoff M. & S. Co., Denver; Western Elec. Co., San Francisco, Seattle, Portland, Los Angeles, Salt Lake City; Alexander & Lavenson, San Francisco; Listenwalter & Gough, Los Angeles.

MANNING, MAXWELL & MOORE, New York City——Western Manning, Maxwell & Moore, San Francisco.

MARATHON ELEC. MFG. CO., Wausau, Wis.

MARBLE-CARD ELEC. CO., Gladstone, Mich.——W. F. Murphy, Denver; Power Equip. Co., Portland.

MARIS BROS., INC., Philadelphia, Pa.——Berger & Carter Co., San Francisco and Portland.

MARION INS. WIRE & RUBBER CO., Marion, Ind.——McMahan & Ryan Co., Los Angeles; Reiman Wholesale Elec. Co., Los Angeles.

MARING WIRE CO., Muskegon, Mich.——James P. Hermans Co., San Francisco.

MARTIN, H. P., & SONS, Owensboro, Ky.——M. J. O'Fallon Supply Co., Denver Elec. Appl. Co., San Francisco; Los Angeles Elec. Sup. Co., Myers Elec. Sup. Co., Los Angeles.

MASON REGULATOR CO., Boston, Mass. —— Gordon & Finkbeiner, Portland.

MATHIAS KLEIN & SONS, Chicago, Ill.——H. B. Squires Co., Los Angeles, San Francisco, Seattle.

MATTHEWS, THE W. N. CORP'N, St. Louis, Mo.——B. C. Holst, San Francisco.

MATTHEWS ENG. CO., Sandusky, Ohio——Herzog Elec. & Eng. Co., San Francisco.

MATHEWS CONVEYOR CO., Elwood City, Pa.——Mailler Searles, Inc., San Francisco.

MAXIM SILENCER CO., Hartford, Conn.—Noise Reducing Devices.

MAYTAG CO., Newton, Ia.—— Chas. H. Long, Western Sales Representative, Portland; Schlueter's, San Francisco, Los Angeles, Oakland; Holle-Mason Hdwe. Co., Spokane; Sloat Wholesale Co., Portland; Southern Electrical Co., Oakland; Maytag Intermountain Co., Salt Lake City & Denver.

MAZDA SERVICE OF G. E. CO., Harrison, N. J.——General Electric Co., San Francisco, Los Angeles, Portland, Tacoma, Seattle, Spokane, Denver, Butte, Salt Lake City.

McFARLAND, L. D. CO., LTD., Sandpoint, Idaho——Maydwell & Hartzell, Inc., San Francisco, Los Angeles.

McLAUGHLIN GLASS CO., Los Angeles——Maydwell & Hartzell, Inc., San Francisco, Los Angeles.

MEAD-MORRISON MFG. CO., East Boston, Mass. —— Edw. R. Bacon Co., San Francisco, Los Angeles; L. A. Snow, Earl B. Staley Co., Seattle.

MEADOWS MFG. CO., Bloomington, Ill.——L. A. Robinson, Western Sales Rep., Los Angeles; Butte Elec. Supply Co., Butte, Mont.; H. G. Overbeck, Denver; Capital Electric Co., Salt Lake City; Mfrs. Representatives Co., San Francisco and Los Angeles; Fobes Supply Co., Portland and Seattle; Walker Elec. Co., Boise.

MEMCO ENG. & MFG. CO., Long Island City, N. Y.——Western Elec. Co., all principal cities.

MERCURY MFG. CO., Chicago, Ill. ——A. S. Lindstrom, San Francisco; H. A. Killam, Portland.

METROPOLITAN DEVICE CORP., Brooklyn, N. Y.——Pennoyer Copper Products Co., San Francisco.

METROPOLITAN ELEC. MFG. CO., Long Island City, N. Y.—— Electric Specialty Co., Inc., San Francisco, Seattle, Los Angeles, Portland; A. S. Knight, Seattle.

METROPOLITAN MFG. CO., Brooklyn, N. Y.——Alexander W. Bromberg, San Francisco.

MICA INSULATOR CO., New York, N. Y.——Electric Specialty Co., Inc., San Francisco, Los Angeles.

MIDWEST AIR FILTERS, Inc., New York City——Midwest Air Filters Pacific, San Francisco; Lewis & Watts, Portland, Ore.

MID WEST METAL PRODUCTS CO., Muncie, Ind.——W. I. Otis, San Francisco.

MILLER CO., The, Meriden, Conn. ——Factory Representative, O. R. Forsberg, Los Angeles; Newbery Elec. Corp., Los Angeles.

MILLER, GEO. B., & SON CO., Waterloo, Ia.——W. L. Cleveland, Los Angeles.

MILLER IMPROVED GAS ENGINE CO., Springfield, O.—— C. E. Ingalls, San Francisco.

MILWAUKEE TANK WORKS, Milwaukee, Wis. —— Milwaukee Tank Wks., San Francisco; Oscar W. Willer, Los Angeles.

MINERALLAC ELEC. CO., Chicago ——A. F. Douglas, Seattle; Special Service Sales Co., San Francisco and Los Angeles.

MINIATURE BREAKER CO., Long Island, N. Y. —— Maydwell & Hartzell, Inc., San Francisco.

MITCHELL-VANCE CO., New York City.

MOE-BRIDGES CO., Milwaukee, Wis., New York City——Moe-Bridges Co., San Francisco, B. J. Wildman, Mgr.

MODERN LAUNDRY MACHINE CO., Kansas City, Mo.——Geo. E. Prine, Western Sales Representative, Los Angeles; A. A. Wilson, Los Angeles.

MOLONEY ELEC. CO., St. Louis ——Garland-Affolter Eng. Co., Los Angeles, San Francisco, Seattle; Mountain States Machy. Co., Denver.

MONARCH REFILLABLE FUSE CO., Jamestown, N. Y.——Elecl. Specialty Co., Inc., Los Angeles, Portland, San Francisco, Seattle; P. L. Hoadley, Seattle.

MONITOR CONTROLLER CO., Baltimore, Md.——W. Montelius Price Co., Seattle.

MOORE STEAM TURBINE CORP'N, Wellsville, N. Y.—— Pacific Power Eng'rs, Inc., Los Angeles.

MORGANITE BRUSH CO., New York City——Special Service Sales Co., San Francisco and Los Angeles.

MORRIS, I. P., DEPT. OF WM. CRAMP & SONS SHIP & ENGINE BUILDING CO., Philadelphia——Pelton Water Wheel Co., San Francisco.

MORRIS MACHINE WKS., Baldwinsville, N. Y. —— Gordon & Finkbeiner, Portland.

MOSS SCHURY MFG. CO., INC., Detroit——Shilton Sales & Mfg. Co., Fresno, Calif.

MUELLER ELEC. CO., Cleveland, Ohio——H. E. Marshall, San Francisco.

MULTI ELEC'L. MFG. CO., Chicago——Keeler White Co., San Francisco; J. J. Schaller Co., Los Angeles.

MULTIPLE ELECTRIC PRODUCTS CO., Newark, N. J.—— E. F. Baldwin, San Francisco.

MUNSELL & CO., EUGENE, New York, N. Y.——Electric Specialty Co., Inc., San Francisco, Seattle, Portland, Los Angeles.

MURDOCK CO., WM. J., Chelsea, Mass.——Keeler, White, Co., San Francisco; Leo J. Meyberg Co., Los Angeles, San Francisco.

MUTUAL ELEC. & MACHINE CO., Detroit——Keeler, White Co., San Francisco, Los Angeles.

NASH ENG'G CO., S. Norwalk, Conn. —— Gordon & Finkbeiner, Portland.

NATIONAL CARBON CO., Chicago——Illinois Elec. Co., Los Angeles; National Carbon Co., San Francisco, Seattle; Kimball Upson Co., Sacramento; Union Hdwe & Metal Co., Los Angeles; Butte Elec. Supply Co., Butte, Mountain Elec. Co., Butte.

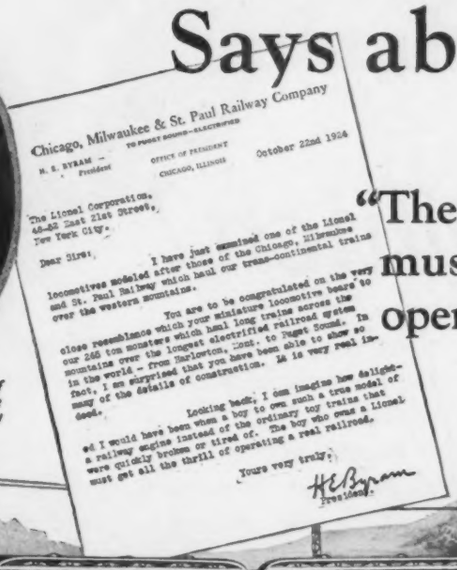
NATIONAL ELEC. PORCELAIN CO., Carey, Ohio——Keeler-White Co., San Francisco, Los Angeles.

NATIONAL ELEC. PRODUCTS CORP'N, Chicago——L. M. Mintzer, San Francisco; Frank L. Pollard Co., Oakland.

NATIONAL ENAM. & MFG. CO., Pittsburgh, Pa. —— Baker-Joslyn Co., San Francisco, Los Angeles, Seattle.

What a Big Railroad Man Says about Lionel

H. E. Byram, President of the Chicago, Milwaukee and St. Paul Railway



Chicago, Milwaukee & St. Paul Railway Company

H. E. BYRAM — President — TO PUGET SOUND—ELECTRIFIED — OFFICE OF PRESIDENT — CHICAGO, ILLINOIS — October 22nd 1924

The Lionel Corporation,
48-52 East 21st Street,
New York City.

Dear Sirs:

I have just examined one of the Lionel locomotives modeled after those of the Chicago, Milwaukee and St. Paul Railway which haul our trans-continental trains over the western mountains.

You are to be congratulated on the very close resemblance which your miniature locomotive bears to our 265 ton monsters which haul long trains across the mountains over the longest electrified railroad system in the world — from Harlowton, Mont., to Puget Sound. In fact, I am surprised that you have been able to show so many of the details of construction. It is very real indeed.

Looking back, I can imagine how delighted I would have been when a boy to own such a true model of a railway engine instead of the ordinary toy trains that were quickly broken or tired of. The boy who owns a Lionel must get all the thrill of operating a real railroad.

Yours very truly,

H. E. Byram
President.

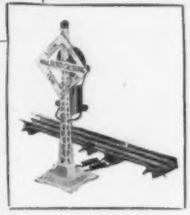
"The Boy who owns a Lionel must get all the thrill of operating a real railroad"

The illustration in this ad will be featured in our national advertising campaign to consumers in prominent home and boys' magazines and newspapers.

THE GREATEST DISPLAY FEATURE EVER MADE!

LionelAutomatic Train Control — The greatest achievement in model railroad engineering. Starts and stops trains automatically. Just one of the many wonderful realistic railroad devices in the LionelLine of Accessories.

DEMONSTRATE ONE IN YOUR WINDOW



The Lionel Bell Warning Signal — As the train approaches the grade crossing, bell automatically rings — stops ringing as soon as train has passed. Steel construction throughout.

Lionel "Multivolt" Transformers. Ever-reliable power plants. Run all trains best. A type for every size train.

Get Your Share of These Profits!

THE letter above from the President of the biggest electrified railroad in the world, shows what famous authorities think of Lionel Trains. Dealers' ever-increasing sales records for twenty-five years show that boys and their parents prefer Lionel.

Lionel Trains have been Standard of the World since 1900. Lionel Leadership is more clearly apparent this year than ever before. For example: there's a complete Lionel Electric outfit of supreme quality to retail at **$5.75**—a value that has never been approached. Other outfits at prices to suit every purse.

Get your share of the profits that Lionel Leadership is making for dealers. The big Lionel 1924 advertising in The Saturday Evening Post, boys' magazines and newspapers throughout the country is sending thousands of customers to Lionel dealers daily.

Place Your Lionel Order Now!

Write at once for the new 44-page Lionel catalog and trade price sheet.

The LIONEL CORPORATION
48-52 East 21st Street New York City
Western Coast Rep.: M. Sweyd, 180 New Montgomery Street, San Francisco, Cal.

LIONEL ELECTRIC MODEL RAILROAD ACCESSORIES TRAINS

"MULTIVOLT" TRANSFORMERS

WHEN a motor burns out, find out why. Is it really a case of motor failure—or of *fuse* failure?

If it is a case of fuse failure, it is *your* failure—your failure to make sure that the fuse you use is dependable.

Real economy demands the use of a really dependable fuse. For instance, suppose you operate a 20-hp. motor; a NOARK 220-volt fuse of this rating would cost about fifteen cents. An inferior fuse might be purchased for about three cents less. But if the motor burns out because of the failure of such a fuse properly to protect the motor, you are faced with the necessity of spending about $75.00 to have the motor re-wound. And, in addition, you suffer loss of production while this is being done.

The common trouble, however, with the inferior fuse is that it blows *too soon*—blows below rating—blows when the circuit is in no real danger. Consequently, the use of such fuses imposes repeated and unnecessary service interruptions, compelling an annoying delay while the plant electrician or machine operator replaces the fuse.

Repetition of such annoyance leads the careless employee to use fuses of excessively high rating—or even to "jump" the fuse clips with a heavy wire. And, in consequence, the next severe motor overload on that circuit burns out the motor because the circuit is unprotected.

NOARK Fuses are worth the few cents difference in their cost compared to inferior fuses because NOARK Fuses blow exactly in accordance with practical operating requirements of safety. They do not blow too soon—nor too late. They never interrupt service unnecessarily, nor fail to interrupt service when failure to do so means a greater trouble.

NOARK Fuses represent the highest quality possible to put into fuse construction. They are sold at the lowest price consistent with such quality. And their service affords the highest ultimate economy.

The Johns–Pratt Company

HARTFORD, CONNECTICUT

TRADE MARK

REG. U. S. PAT. OFF.

Division of Colt's Patent Fire Arms Mfg. Company

BOSTON NEW YORK CHICAGO SAN FRANCISCO

Export Department, 30 Church Street, New York, N. Y., U. S. A.

TRADE MARK

PROTECTION SERVICE JP VULCABESTON

REG. U. S. PAT. OFF.

6820-2

J-P

has the ability and capacity to serve you in NINE ways

1
NOARK Fuses

2
NOARK Fuse Clips and Bases

3
NOARK Service and Subway Boxes

4
ALL-SAFE Switches

5
NOARK Universal Service Entrance Switches

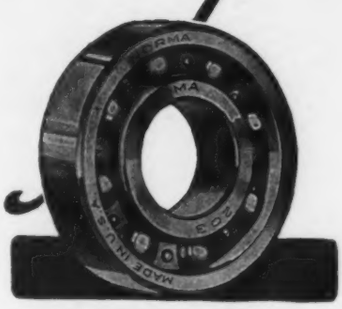
6
Railway and mine material, hangers, insulators, etc.

7
J-P molding service—contract basis

8
VULCABESTON Packing—sheet, rope, braided

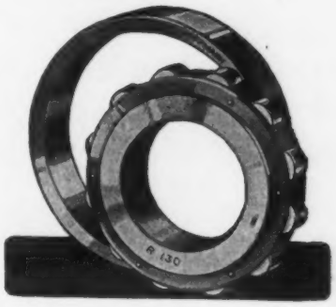
9
J-P molded radio parts—from stock

Why Should the Life and the Earning Power of an Electric Motor be Limited by its Bearings?



"NORMA" PRECISION BALL BEARINGS

and
"HOFFMANN" PRECISION ROLLER BEARINGS



MAKE GOOD MOTORS BETTER

Motor windings seldom fail. Good insulations stand up. Commutators wear but slowly. Brushes are easily and inexpensively replaced.

What, then, makes motors "wear out"? What cuts down their efficiency and finally fails?

Experience, alike of motor manufacturer and motor user, furnishes the answer—INADEQUATE, UNRELIABLE, SLEEVE TYPE BEARINGS.

Whatever of anti-friction quality a sleeve type bearing possesses, it has by virtue of the lubricant used and not because of any friction-reducing quality in the sleeve type bearing itself.

The success or failure of such a bearing, then, depends upon its lubrication. Inadequate, or neglected, or improper lubrication means the failure of the sleeve type bearing—and this means the failure of the motor.

The one and only complete solution of the motor bearings problem lies in the use of true anti-friction bearings—

Bearings which, though vastly improved in their operation by ample and proper lubrication, are yet not absolutely dependent upon the lubricant for their anti-friction qualities—

Bearings designed to provide, in their mountings, a store of lubricant ample for long periods of high-efficiency operation, without renewal or attention—

BALL BEARINGS, for motors of smaller power and higher speeds. ROLLER BEARINGS, for motors of larger powers and heavier duty.

The production cost, to the manufacturer, and the purchase price, to the buyer, may be a little higher for the ball or roller bearing motor.

But this difference is far over-shadowed by the subsequent savings resulting—the saving in lubricant, the saving in current, the uninterrupted service, the lower up-keep, the longer life of sustained high efficiency.

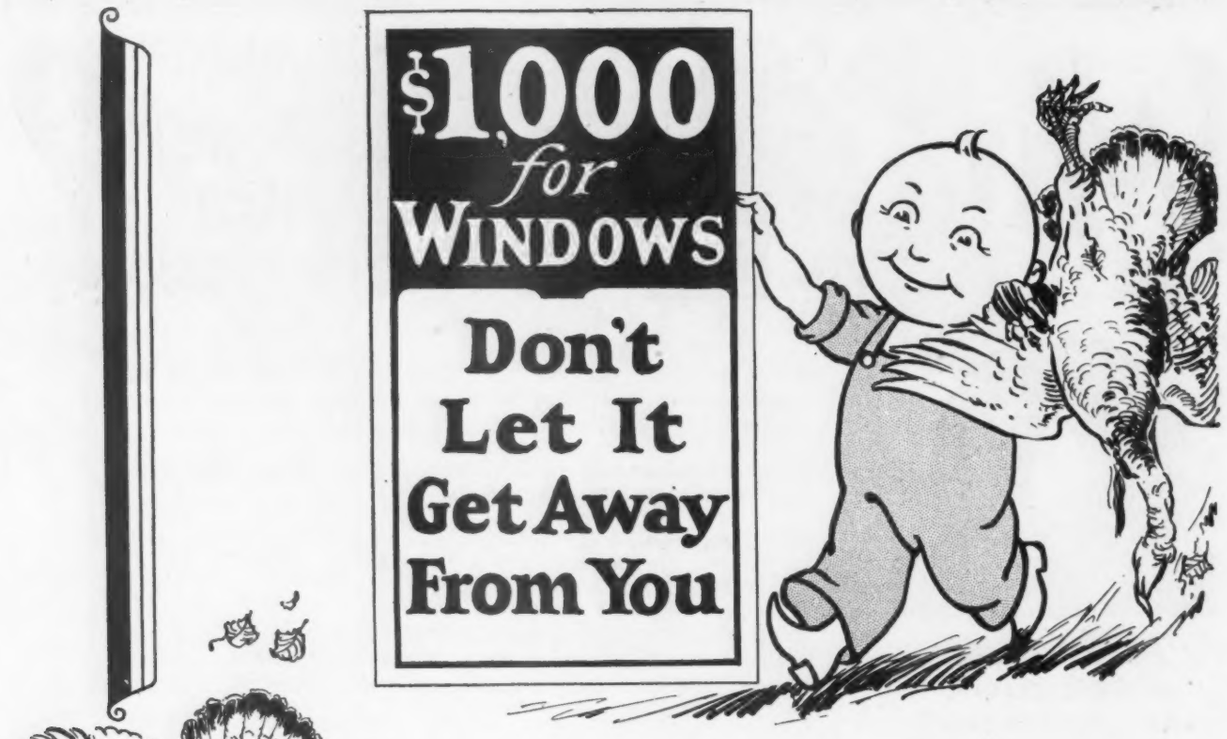
Exhibited at Booths 234-5
National Exposition of Power and Mechanical Engineering,
New York, December 1-6, 1924

NORMA-HOFFMANN BEARINGS CORPORATION

Anable Avenue Long Island City New York

PRECISION BALL, ROLLER AND THRUST BEARINGS

695



Every Dealer is Eligible

Locatap
No. 1080

Duolet
No. 122

Localet
No. 77

Here is another chance to get in on the big $1,000 Benjamin Two-Way Plug

Prize Window Contest

Send at once for your Thanksgiving Window Trim—it's free. Dealers everywhere are cashing in on big sales and profits, in addition to which there is the chance at one of those forty-three fine prizes. Send to-day for full particulars.

Benjamin Electric Mfg. Co.

120-128 S. Sangamon St., Chicago

247 W. 17th St.
New York

448 Bryant St.
San Francisco

BENJAMIN

Makers of Things More Useful

Memorandum
There's still time to start the Home Lighting Essay Contest.
If you haven't already started one in your town, get in touch with the Lighting Educational Committee, 680 Fifth Ave., New York City immediately and ask for details.
N.B. - All essays must be in the hands of the Committee not later than December 15th.

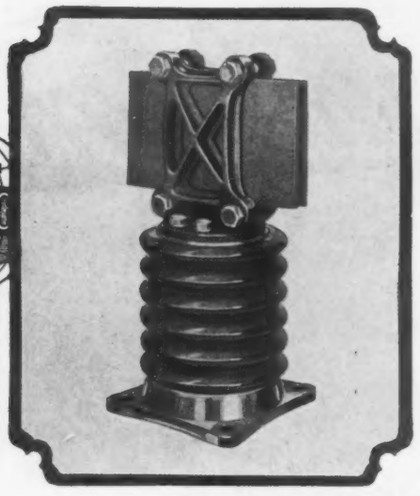
HOME LIGHTING CONTEST

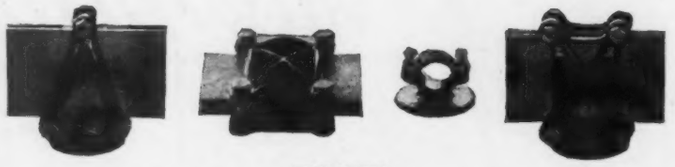
Has Your Town Started a Home Lighting Essay Contest?

NATIONAL MAZDA LAMPS

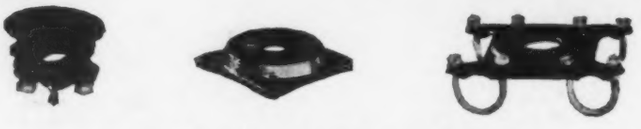
A GENERAL ELECTRIC PRODUCT

Depend On Champion— Interchangeability





BUS TOPS
One half made of malleable iron and other half of manganese bronze



Bases and clamps for pipe mounting; drop-forged steel

Constituent parts of Champion Indoor Bus Supports for various assemblies

Complete interchangeability is one of the many outstanding advantages of the Champion line of indoor bus supports that helps materially to avoid long interruptions of service. It is a valuable feature that wins the approval of everyone concerned.

By reason of the exclusive Champion design, much costly hardware has been eliminated, and the entire assembly simplified.

Porcelain insulators, if broken or damaged in any way, can be quickly removed and easily replaced—a big factor in maintaining service.

Consequently, it is not necessary to stock any of the component parts of the assembly, except the interchangeable porcelain insulators themselves.

This interchangeability applies to the complete Champion line of 4", 5", and 6¼" diameter insulators.

A comparatively small stock of porcelains, various sizes of bar, cable, or tube clamps and style bases, in use on this system, enables the power engineer to assemble any combination of bus support that might be desired for quick changes or minor extensions.

This saving of time and money and the insurance against interrupted service appeal to every engineer.

The Champion line includes all types of indoor and outdoor bus supports, disconnecting switches, choke coils, etc.,—all of the most modern character, and offering substantial superiorities that meet all requirements.

Sales Representatives

RALPH D. ERNEST
205 Kresge Bldg. Detroit, Mich.

J. E. M. MITCHELL
413 Glenn Bldg. Atlanta, Georgia

GARLAND AFFOLTER ENGINEERING CO.
Rialto Bldg. San Francisco, Calif.

GEO. C. OXER
Rooms 512-513, 2 Rector St. New York City

G. R. SCOTT
924 Marquette Bldg. Chicago, Ill.

T. W. McKAY
Manitoba Power Co., Ltd. Winnepeg, Canada

A. H. SAVAGE
914 Pioneer Bldg. St. Paul, Minn.

THE CHAMPION SWITCH COMPANY—550 ABBOTT ROAD—Post Office Box 816—Buffalo, N. Y.

The CHAMPION SWITCH COMPANY

See how the wire threads through the hole

Neat and Safe

THREAD it through the hole! With **National Brackets,** wires can be run, attached or merely threaded. Easier, quicker, neater and at far less cost. Every insulator is designed to withstand a load of 350 lbs. and if it is broken, there still remains a stout U-bolt that will hold the wire secure.

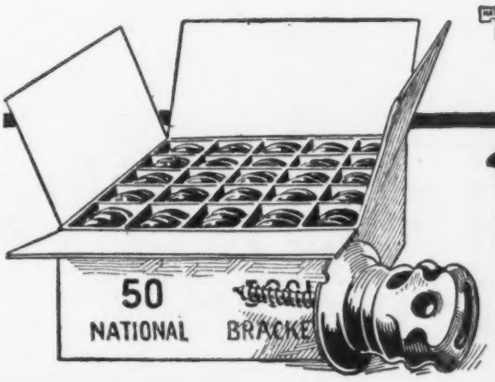
National Metal Molding Company

WORLD'S LARGEST PRODUCERS OF ELECTRICAL CONDUITS AND FITTINGS

1131 **Fulton Building, Pittsburgh, Pa.**

Represented in All Principal Cities

(23)



National Brackets

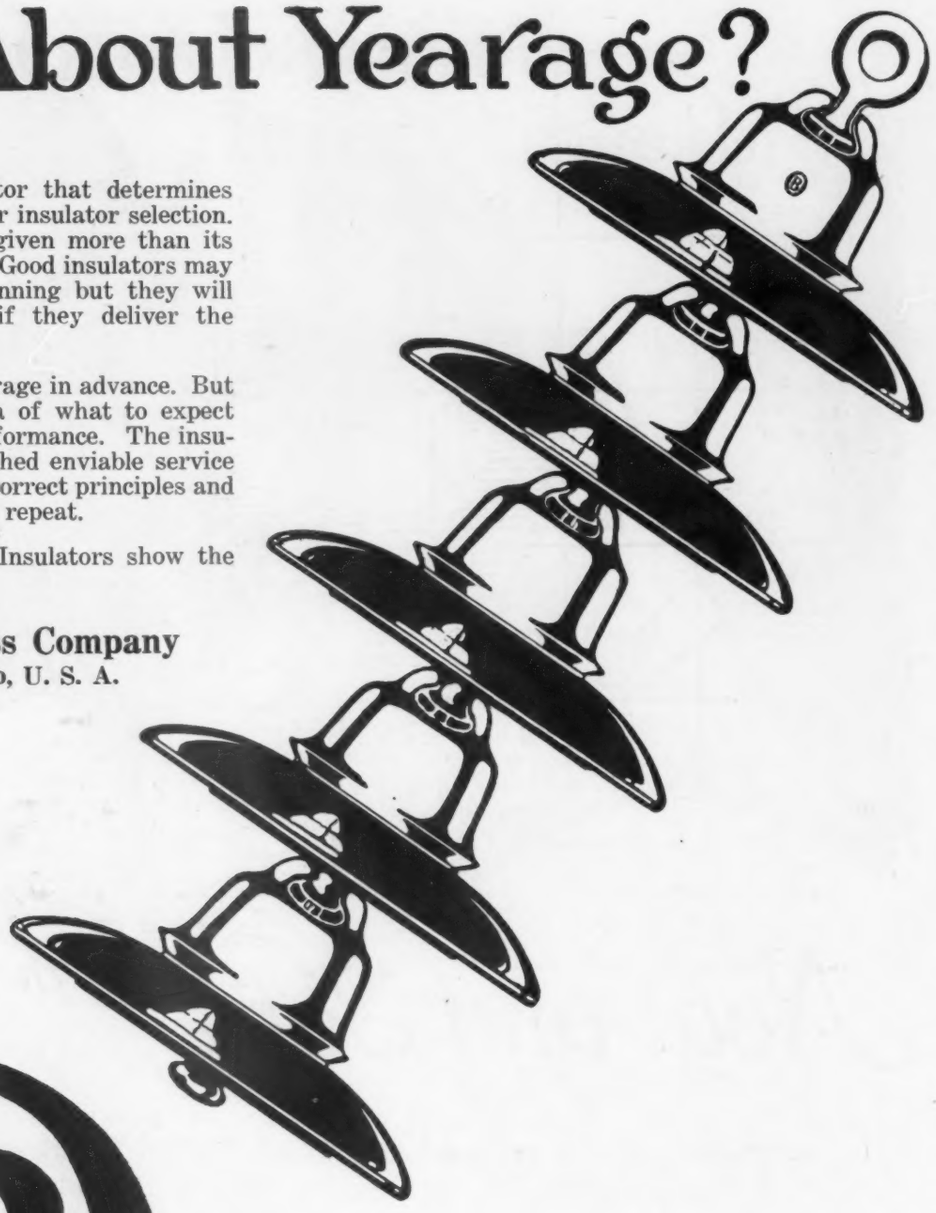
How About Yearage?

Yearage is the one factor that determines the final economy of your insulator selection. First cost is too often given more than its just share of attention. Good insulators may seem costly in the beginning but they will be cheap in the end—if they deliver the yearage.

You cannot measure yearage in advance. But you can get a good idea of what to expect from a study of past performance. The insulators that have established enviable service records are made under correct principles and can be depended upon to repeat.

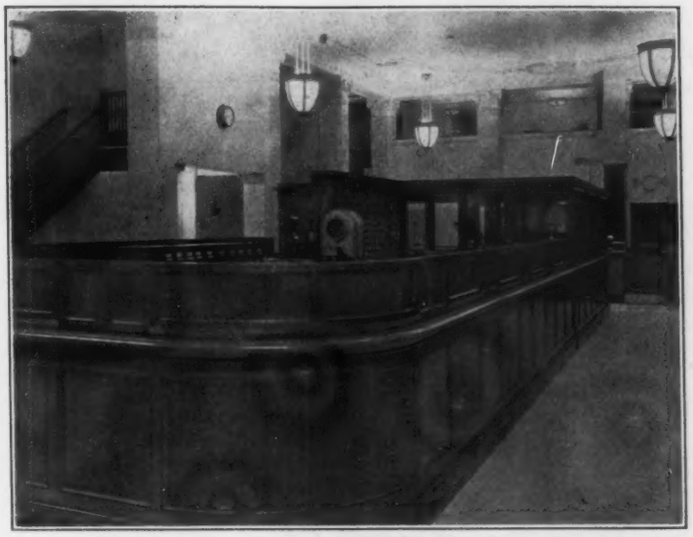
Service records of O-B Insulators show the way to more yearage.

The Ohio Brass Company
Mansfield, Ohio, U. S. A.



O-B INSULATORS

TIME IS THE TEST



Office of the Pacific Gas and Electric Co., Oakland, using a Curtis "Luminous Bowl" unit with X-Ray Reflectors for indirect lighting.

Curtis Lighting

with

X-Ray Reflectors

EVERLASTING BRILLIANCY

serves the

Central Station

in EVERY

Department

FOR the Central Station office, display, or drafting room, the Curtis Indirect "Luminous Bowl" unit combines pleasing design with perfect lighting results.

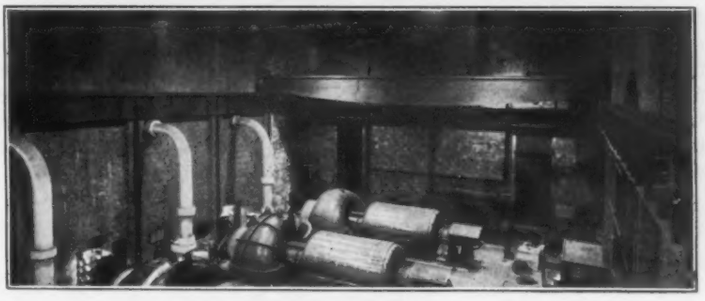
For exterior floodlighting, X-Ray Projectors produce exceptional results. Such beautiful floodlighting jobs as the San Joaquin Power Building, Fresno; the Wrigley Building, Chicago; and the Lexington Building, Baltimore, are X-Ray installations.

During 1924, arrangements have either been completed or equipment has actually been installed for X-Ray lighting in the following:

Pacific Gas and Electric Co., San Francisco
San Joaquin Light and Power Co., Fresno
Los Angeles Gas and Electric Bldg., Los Angeles
San Diego Consolidated Gas & Electric Bldg., San Diego

San Joaquin Power Building, Fresno, presents a striking appearance at night, with 10 different color combinations possible.

Power House installation of X-Ray industrial "Beehive" reflectors. Perfect distribution of light is assured.



Curtis Lighting, Inc.

31 W. 46th St., New York

1134 W. Jackson Blvd., CHICAGO

Merchants Nat'l Bank Bldg., Los Angeles

SAFEGUARDING YOUR REVENUE

The severest tests to which a DUNCAN meter is put, occur in our shop and laboratory

Three times the meter is subjected to an insulation breakdown test of 2300 volts, first in the factory, after the meter has been assembled, second in the laboratory immediately upon arrival there, and third after the laboratory tests are finished just before the final inspection.

After the second high voltage test, the meter is "lagged" on zero power factor, then delivered to the test racks where it is tested on 5% and 100% load at unity power factor, and with full load current at 50% power factor. The last test is a check on the zero power factor setting. The work of each meter tester is checked by a checker, and if the meter is passed it goes to the "service run" rack, where it undergoes a registration test for a period of 20 hours. After the service run, it is again checked on 5% and 100% loads unity power factor as a final check on its accuracy.

DUNCAN ELECTRIC MANUFACTURING CO. • LAFAYETTE, IND. •

The Whole Story

About

"NATIONAL"

HAMMER-WELD PIPE

(Sizes 20 to 96 inches)

given in our new Bulletin No. 13, under the following Chapter Heads and Tables:

Manufacture and Materials. Characteristics. Installation Advantages. Protective Coatings. Joints. Uses of Hammer-weld Pipe in Penstocks, Water Lines, Gas Lines, Air and Steam Conduits, High Pressure Vessels, etc. Standard Specifications. O. D. and I. D. Sizes Listed. Water Velocities in Hydro-Electric Plants. Flow of Water in Pipes. Internal Fluid Pressures. Other Tables, Charts and Diagrams, together with 73 illustrations.

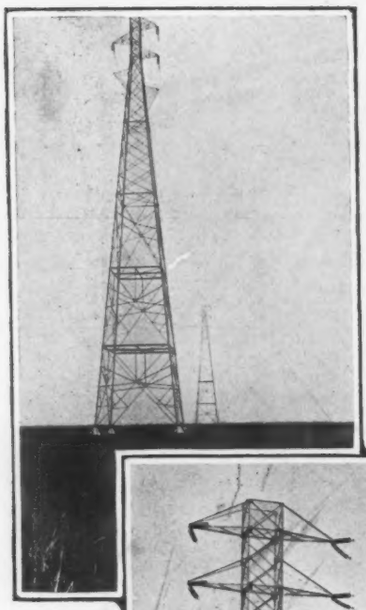
NATIONAL TUBE COMPANY General Sales Offices FRICK BUILDING **PITTSBURGH, PA.**

Please send Bulletin No. 13-"NATIONAL" Hammer-weld Pipe - to

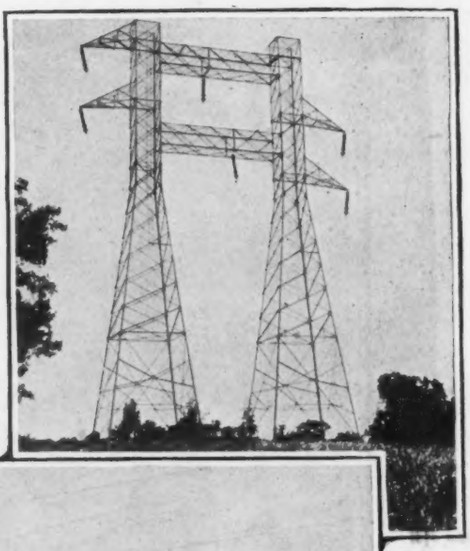
Name .....

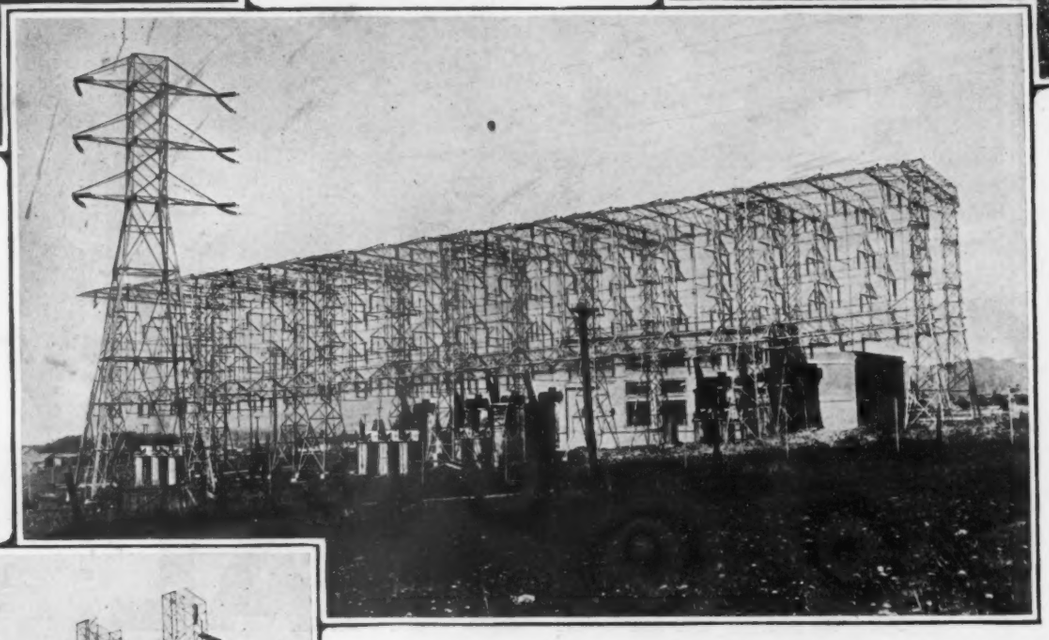
Address .....

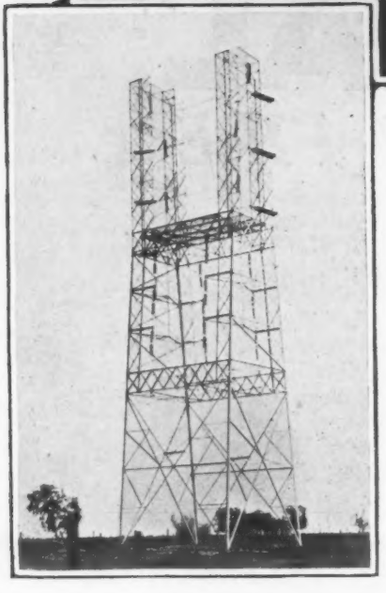
.....



Built of
SPECIAL
TOWER
STEEL







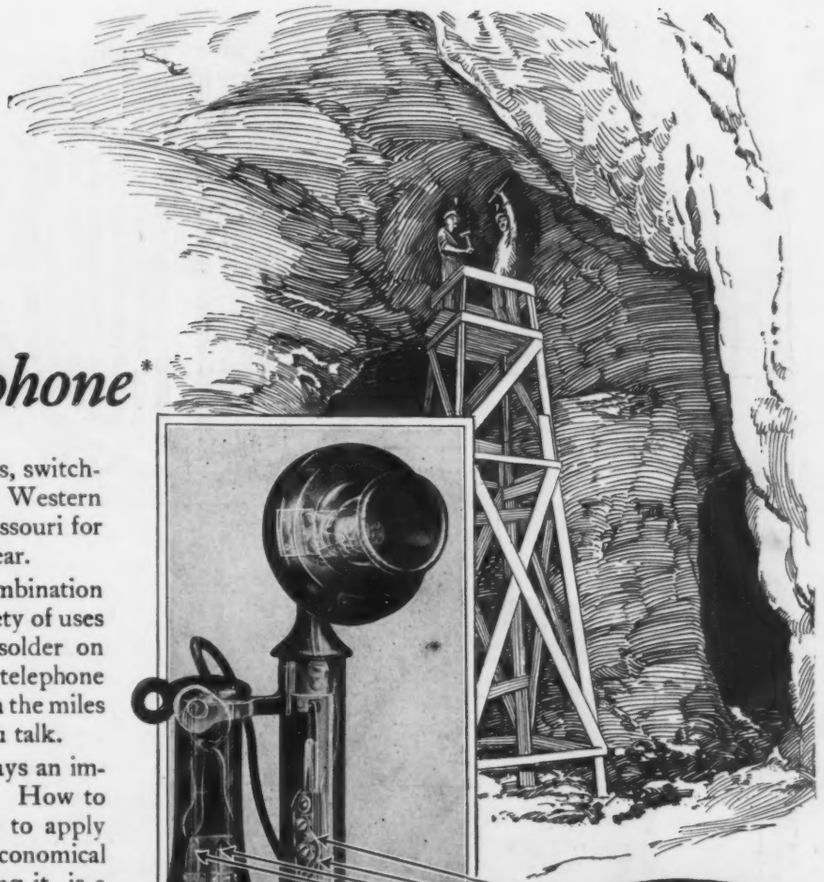
SPECIAL Transmission Line Structures, required by out-of-the-ordinary conditions, are as readily taken care of by this Company as the simplest of standard towers — with Special Tower Steel, of course.

PACIFIC COAST STEEL COMPANY

MANUFACTURERS OF
OPEN HEARTH STEEL
STRUCTURAL SHAPES MERCHANT AND REINFORCING BARS
TRANSMISSION TOWERS AND STRUCTURES
Gen'l Office: Rialto Bldg., San Francisco Plants: San Francisco, Portland, Seattle

"The Structures that Go Together"

Lead
—*in your telephone**

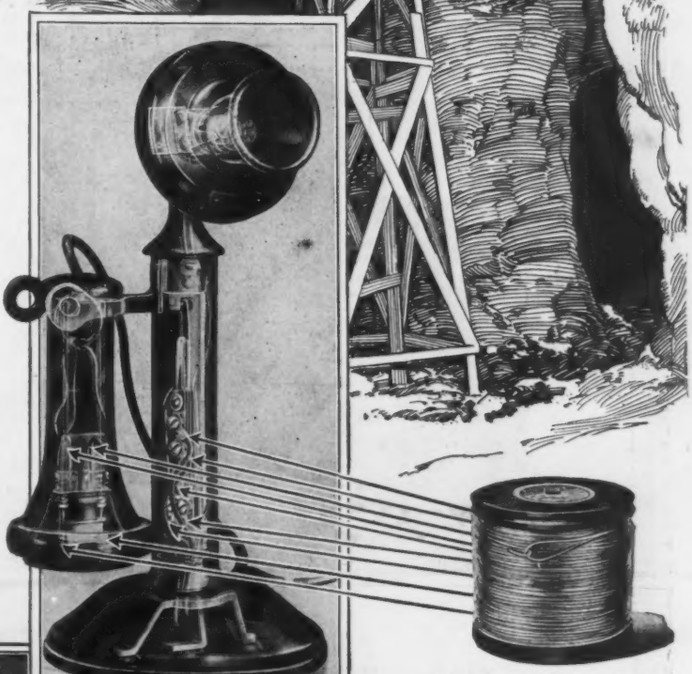


IN the manufacture of telephones, switchboards and telephone cable, Western Electric looks to the mines of Missouri for millions of pounds of lead each year.

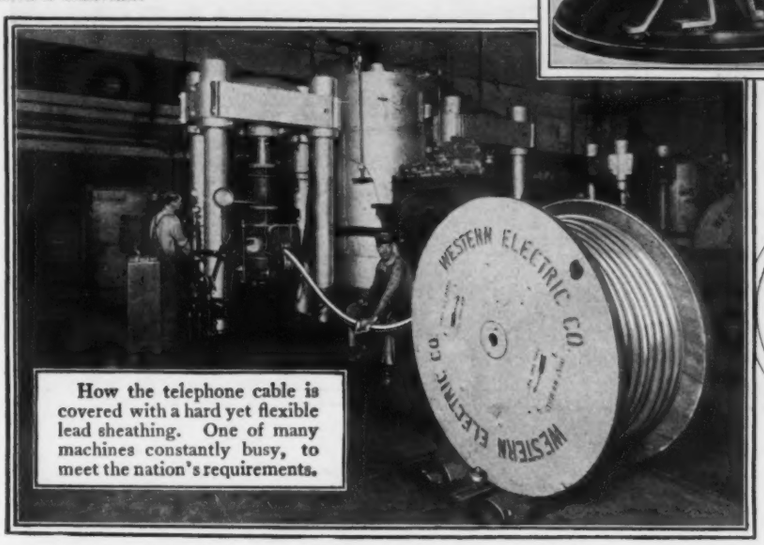
These great shipments, in combination with other metals, are put to a variety of uses —ranging from the little dabs of solder on the terminals of cords inside your telephone to the heavy protective covering on the miles of telephone cable over which you talk.

In these and other ways lead plays an important part in telephone service. How to handle this heavy material, how to apply quicker and better and more economical methods in moulding and pressing it, is a knowledge which Western Electric has acquired through fifty-five years' experience.

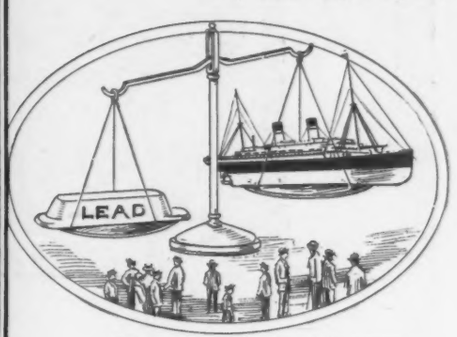
*No. 9 of a series on raw materials.



From the lead mine to a spool of solder—for permanent electrical connections between many small telephone parts.



How the telephone cable is covered with a hard yet flexible lead sheathing. One of many machines constantly busy, to meet the nation's requirements.

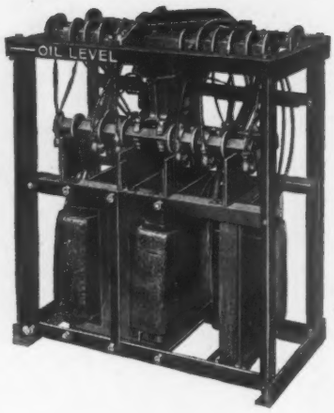


The amount of lead used in a year by Western Electric is greater than the displacement of a giant steamship like the White Star liner Homeric.

Western Electric

SINCE 1869 MAKERS AND DISTRIBUTORS OF ELECTRICAL EQUIPMENT

EC HIGH VOLTAGE DUST VAPOR WEATHER FOOL FIRE PROOF &M COMPENSATOR



This is a push button operated, automatic high voltage Compensator.

It is entirely enclosed as the top view shows.

It is oil immersed.

The case is dead electrically so that it is not necessary to build an enclosing case.

The push button operates on a low voltage circuit, which circuit is independent of the high voltage circuit. There is no danger of the operator coming into contact with the high voltage.

It is entirely automatic. When the start button is pushed the motor is started on a low voltage obtained from the transformers in the Compensator. After the motor has accelerated to a speed where it is safe to throw it across the line, the Automatic Compensator takes care of this operation.

The Overload Device protects against overloads at all times and prevents any damage due to single phasing.

Write for Bulletin 1047

THE ELECTRIC CONTROLLER & MFG. CO.

CLEVELAND, OHIO

FOR SOUTHERN CALIFORNIA: THOMAS MACHINERY CO. AMERICAN BANK BLDG. LOS ANGELES

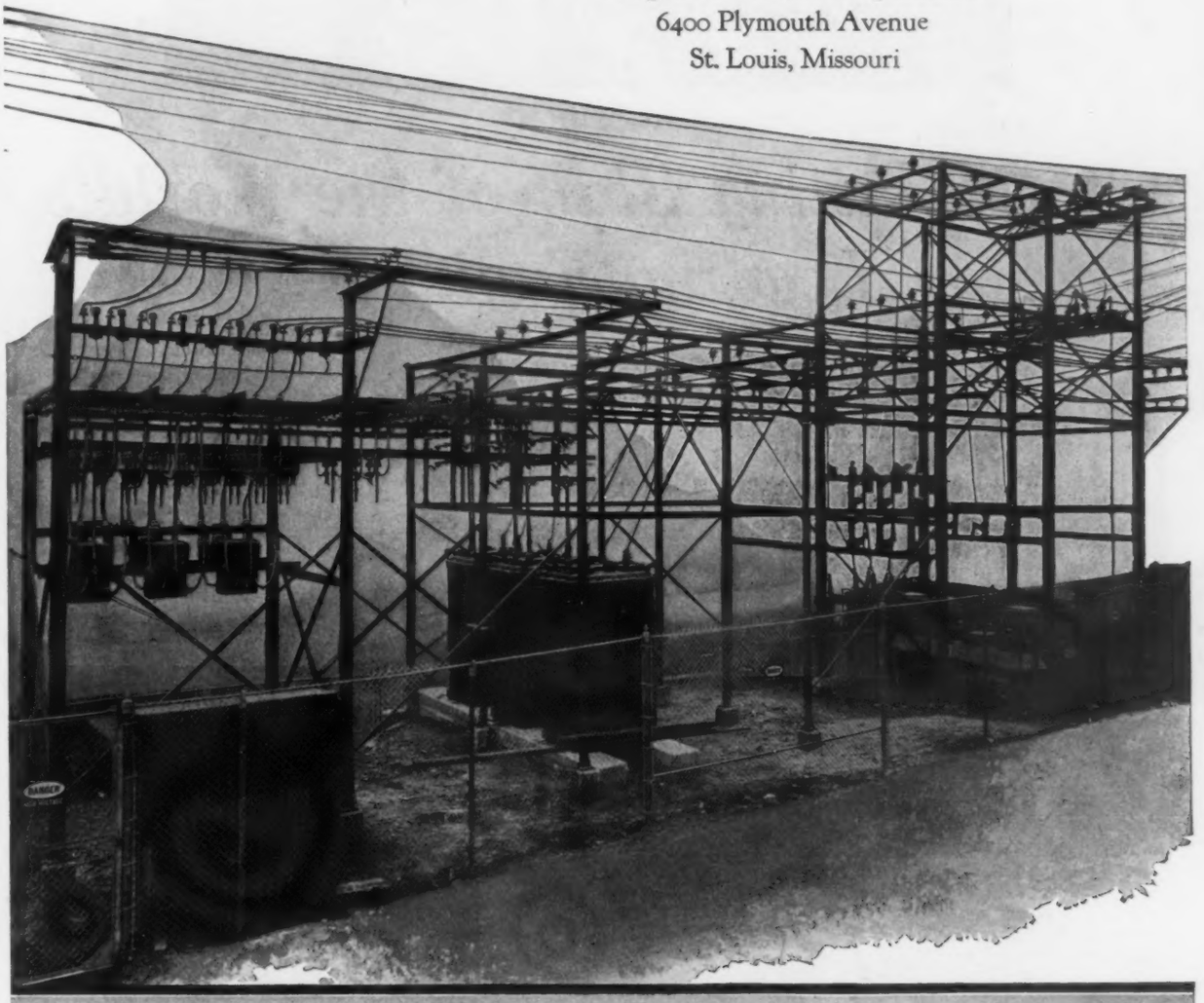
FOR STATES OF OREGON AND WASHINGTON: W. MONTELIUS PRICE, SEATTLE, WASH.

FOR NORTHERN CALIFORNIA: C. F. HENDERSON, CALL BLDG., SAN FRANCISCO

Wagner, Quality Transformers now in production will soon be serving somebody as satisfactorily as the many thousands of them already in the field.

On your next transformer order—*be "somebody."*

Wagner Electric Corporation
6400 Plymouth Avenue
St. Louis, Missouri



Wagner, Quality Transformers

distribution and power types in a wide range of styles and sizes

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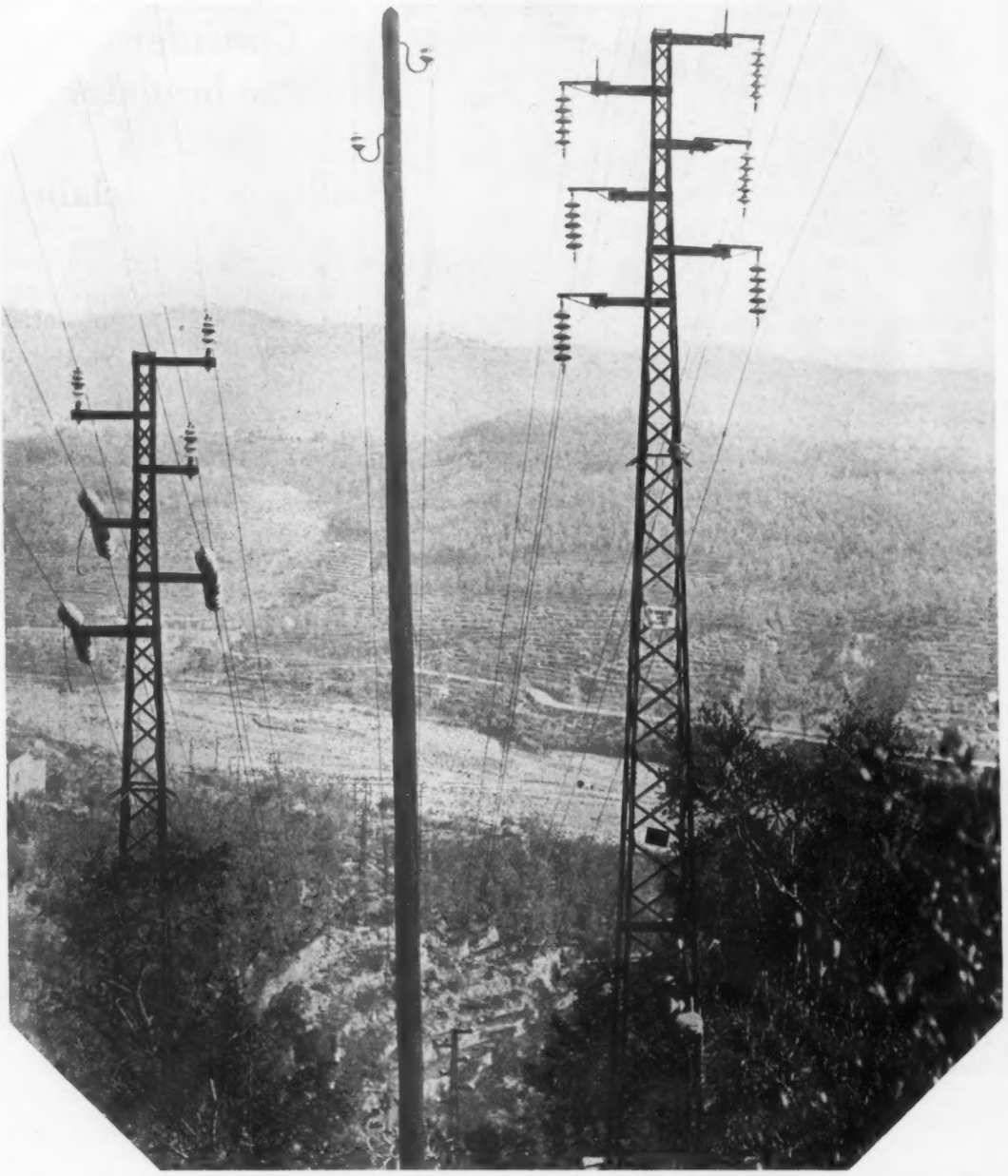


RUGGED INSULATORS

Over rugged country in the Italian Alps J-D insulators prevent costly replacements and interruptions to important service. Here and elsewhere the rugged insulator is the successful insulator.

Jeffery-Dewitt Insulator Company

Kenova, W. Va.

Pacific Coast Representatives:

Garland Affolter Enginering Corporation
Seattle · San Francisco · Los Angeles

Sales Offices in Principal Cities

JEFFERY-DEWITT INSULATOR CO. KENOVA, W.VA. U.S.A.

That Additional "Something"

No. 999 Xtra-Lite

ESTABLISHED in 1906, the Connecticut Electric Manufacturing Company has been steadily increasing and expanding its line of wiring devices, until they have become a nationally known product and are frequently specified by leading architects when making plans and specifications.

No. A-1 Plug

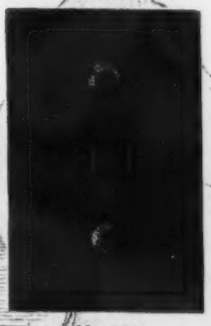
SOME of the finest buildings in the country contain Connecticut A-1 Devices, which were selected on merit, regardless of price. Always alert to the changing conditions and improved methods of the building age, this company has designed and perfected many new devices to meet these requirements.

No. 7121 Switch Plate

No. 7101 Switch Plate

OUR new line of Bakelite devices, illustrated on this page, is a good example of our latest achievement in striving for leadership of practical and properly priced merchandise. Typically Connecticut in design, workmanship and development, they are in keeping with the progress of the art of interior decorating, where only dependable devices are recognized.

They lend that "Additional Something" to public buildings and homes of character.



No. 980
Single Unit Receptacle

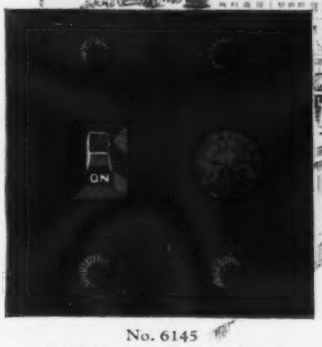
No. 990
Duplex Unit Receptacle

THE CONNECTICUT ELECTRIC MANUFACTURING COMPANY

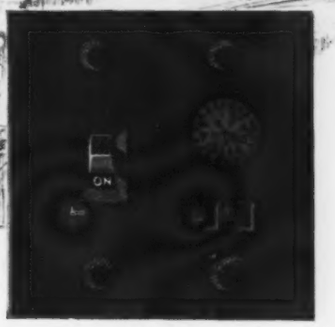
MAIN OFFICE & FACTORY, BRIDGEPORT, CONN.

NEW YORK CHICAGO SAN FRANCISCO

CONNECTICUT "A-1" DEVICES



No. 6145
Bull's Eye Combination Plate



No. 6150
Bull's Eye Combination Plate

No. 6101 Combination Toggle Switch and Duplex Receptacle

The MAJESTIC *gives you* PROFITS *not Promises*

No dealer who knows his stock needs to be told of the QUALITY of Majestic Electric Heaters.

But perhaps you haven't realized yet that even from a cold-blooded, dollar-and-cents point of view it will pay you to concentrate your selling efforts on the Majestic.

Your profit on the Majestic is larger than on a cheaper, less satisfactory heater. Sometimes it's easier to sell the cheaper heater, but you and your customer will both profit if you'll exercise your salesmanship and sell him a Majestic.

Once sold, the Majestic stays sold. It makes no exaggerated claims. There is no "come-back" on the dealer. No "servicing" is necessary. There are no slide-contacts on the heating element to get out of order—no screw base elements to loosen and arc—no trouble of any kind with element contacts.

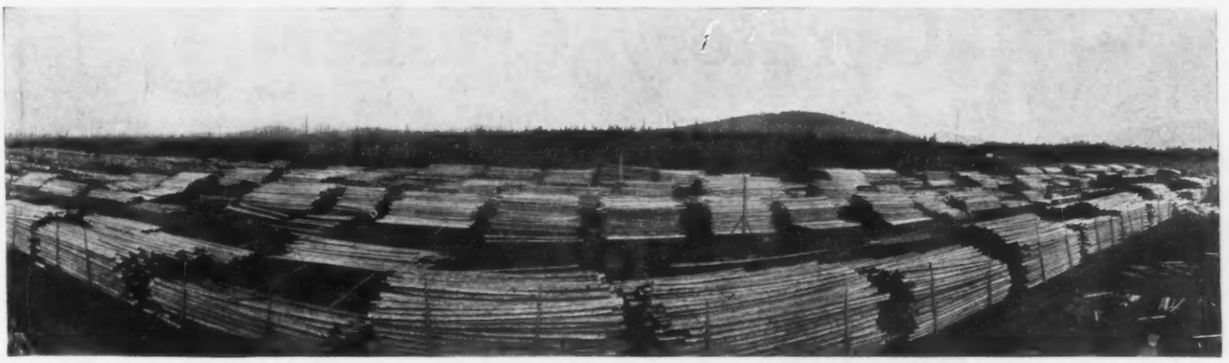
For real service to your customer and real profits for yourself — get behind the Majestic!

A quality product, made by the manufacturers of the famous Majestic Electric Hot Cake and Waffle Iron.

MAJESTIC
Electric Appliance Co.

San Francisco *Kansas City*

→ Before you buy POLES—See Weyerhaeuser ←



THE KOOTENAI, IDAHO, POLE YARD
One of the five immense Weyerhaeuser storage yards where poles are seasoned and prepared for shipment.

Poles are a Specialty Not a Side Line With Us

ON THE Weyerhaeuser timber holdings in the Panhandle of Idaho there is as fine a lot of Red Cedar pole material as you can find anywhere.

That is why the Weyerhaeuser mills years ago began to manufacture high quality poles and why they are today among the largest producers in the country of Idaho Red Cedar Poles.

In this organization poles receive the specialized attention which their production and distribution require. Experienced pole men are in charge of each detail from the selection and felling of the trees in the forest to the shipment of poles to destination.

It is economically possible for the Weyerhaeuser mills to use especial care and extra high standards in the selection of pole material because of the magnitude and diversity of their lumber manufacturing operations. There is no temptation to make poles out of anything other than first class pole timber. Material unsuitable for poles is cut up for other purposes.

Weyerhaeuser poles are now offered to you on a value for value service basis. Shipment from any one of our five well stocked, fully equipped, Western storage yards direct to you without any unnecessary handling charges.

In looking to Weyerhaeuser as one of your major sources of supply, you do so with the assurance that you will be taken care of at all times. The next time you are in the market for poles or piling—either treated or untreated—give this Weyerhaeuser service a tryout. Your inquiries and your orders will be given prompt attention by experienced pole men.

WEYERHAEUSER SALES COMPANY

Distributors: WEYERHAEUSER FOREST PRODUCTS
General Offices · SPOKANE, WASHINGTON

Branch Offices

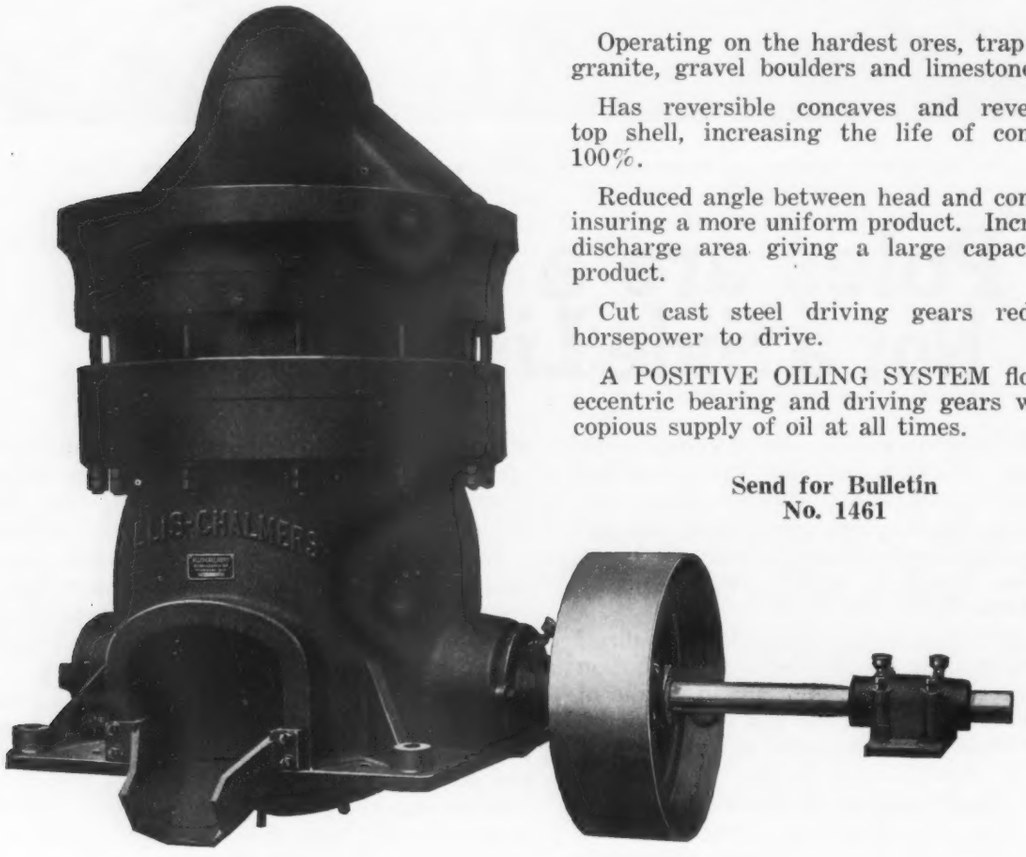
ST. PAUL, 2694 University Ave.
CHICAGO, 208 South La Salle St.
BALTIMORE, 812 Lexington Bldg.
NEW YORK, 220 Broadway

F. H. Burke, Chicago Office, Manager of Cedar Pole Sales
R. L. Bayne, Spokane Office, Manager of Cedar Pole Service

Weyerhaeuser Idaho Red Cedar Poles

Superior McCully Fine Reduction Gyratory Crusher

The most successful secondary gyratory crusher on the market today



Operating on the hardest ores, trap rock, granite, gravel boulders and limestones.

Has reversible concaves and reversible top shell, increasing the life of concaves 100%.

Reduced angle between head and concaves insuring a more uniform product. Increased discharge area giving a large capacity of product.

Cut cast steel driving gears reducing horsepower to drive.

A POSITIVE OILING SYSTEM flooding eccentric bearing and driving gears with a copious supply of oil at all times.

Send for Bulletin No. 1461

Sizes, Capacities, Horse Power and Weights:

Size of Crusher in Inches	Two Feed Openings Size Each in Inches	CAPACITY PER HOUR IN TONS OF 2000 POUNDS									DRIVING PULLEY		H.P. Required	Weight of Crusher in Lbs.
		Size of Discharge Opening in Inches									Size in Inches	R.P.M.		
		¾	⅞	1	1¼	1½	1¾	2	2¼	2½				
6	6x40	24	28	32	40	48	.....	.....	.....	.....	36x12½	500	40 50	32000
10	10x52	.....	.....	.....	.....	80	94	107	120	135	36x18½	450	75 100	64000

ALLIS-CHALMERS

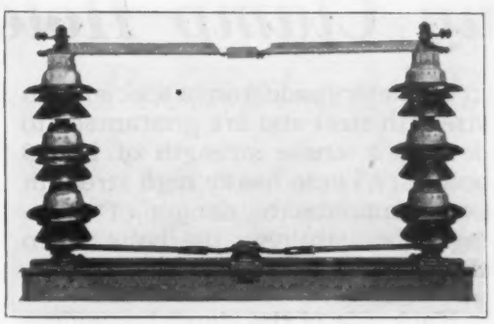
MILWAUKEE, WIS. U. S. A.

THE STANDARD OF COMPARISON

The Delta Star

UNIT TYPE

132,000 Volt Switches



Unit Type PM-Form 2 Switch (Closed Position)

These switches are designed for hand operation, remote control motor operation, or both. The insulators are interchangeable, as characteristic of the lower voltage Unit Type equipment.

PM-Form 2 switches are especially well adapted for opening lines with heavy charging currents. During a recent test, lines having approximately 6400 K.V.A. charging current were successfully opened.

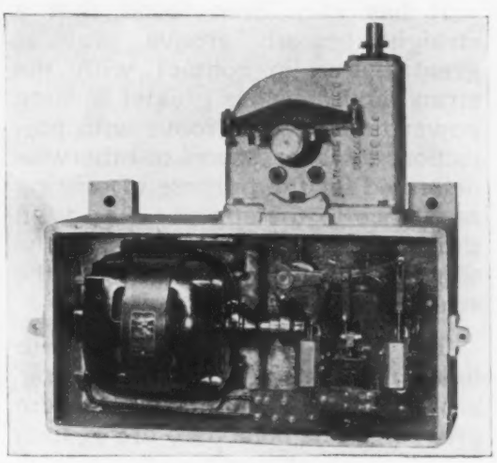
Ball bearings with Alemite greasing system, extra heavy insulators, etc., are used. The entire construction is Unit Type.

Ask for Prices

A large number of 132,000-volt three-pole DELTA-STAR switches are in service, and we are now ready to promptly ship in any desired quantity.

The single-pole element illustrated is but one of several assemblies, in addition to fuse mountings, choke coils, complete outdoor substation units, etc.

Those engineers contemplating 132,000-volt installations are invited to consult our engineers. If possible, come to Chicago and see the equipment for yourself. A lot of public utility men have done this during the past year, and all seem to think the trip worth while.



Switch Motor Operating Unit (With Cover Removed)

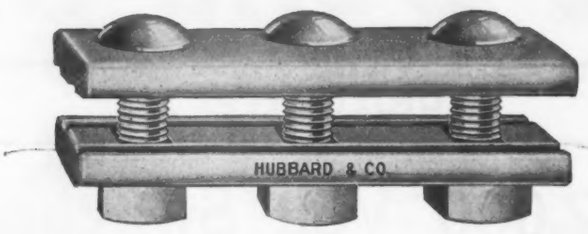
DELTA-STAR ELECTRIC CO.

2400 Block Fulton St Chicago, Illinois

Albany, N. Y., 715 City Savings Bank Bldg.
Birmingham, Ala., 827-830 Brown-Marx Bldg.
Boston, Mass., 294 Washington St.
Buffalo, N. Y., 595 Ellicott Square
Columbus, Ohio, 600 Joyce Realty Bldg.
Detroit, Mich., 708 Ford Bldg.
Indianapolis, 518 Trac. Term. Bldg.
Kansas City, Mo., 301-2 Dwight Bldg.
Knoxville, Tenn., Holston Nat'l Bk. Bldg.
Los Angeles, Calif., I. W. Hellman Bldg.
Minneapolis, Minn., 940 Security Bldg.
New York, N. Y., 25 Broad St.
Orlando, Fla., Cornell-Mathews Co.
Philadelphia, Pa., 1333 Real Estate Trust
Pittsburgh, Pa., 934 Union Trust Bldg.
Rochester, N. Y., 119 Main St., E.
Salt Lake, Utah, 313 Dooly Bldg.
San Francisco, Calif., 193 Second St.
Seattle, Wash., Hoge Bldg.
St. Louis, Mo., Railway Exchange
Syracuse, N. Y., City Bank Bldg.
Toronto, Ont., 213-219 Sterling Rd.
Berthon & Touzot, 40 Rue de Aguisseau, Boulogne-sur-Seine, France
Carrick, Wedderspoon, Ltd., Christchurch, New Zealand
A/S Kraftoverforing Kristiania, Norway
Allenwest, S. A., Ltd., City House, Johannesburg, So. Africa
Allied Engineering Ltd., Sydney, Australia

UNIT TYPE CEMENTED SWITCH INSULATORS

Hubbard Hardware



What Makes a Guy Clamp Hold?

From numerous tests made on every type of guy clamp on the market it has been definitely concluded that the holding power of a clamp depends on the area of the clamping surface actually in contact with the strand — and, the strength of the bolts used.

It has, also, been found that a straight smooth groove provides greater area in contact with the strand and develops greater holding power than a wire groove with projections, notches, scores or otherwise deformed for the purpose of offering resistance to the strand. And with the smooth groove there is not the slightest possibility of injury to the strand.

The No. 7461 clamp is made with heavy rolled steel sides 6 inches long, provided with straight smooth wire grooves. The bolts used are 5/8-inch in diameter made from a special high strength steel and are guaranteed to develop a tensile strength of 18,000 pounds. These heavy high strength bolts eliminate the danger of twisting off or straining the bolts when the nuts are tightened.

Each side of the clamp has square holes punched in it so that any of the bolts may be reversed at will.

When tested under actual working conditions with Siemens-Martin guy strand this clamp will develop an average load of 11,000 pounds without slipping.

This clamp has recently been adopted as the standard of the N. E. L. A. and the A. T. & T. Company.

Furnished, also, in a 2-bolt, 4-inch size, the stock number of which is 7462.

HUBBARD & COMPANY

Pittsburgh, Pa.

"Check" Seal

PACIFIC STATES ELECTRIC COMPANY

SAN FRANCISCO, LOS ANGELES, OAKLAND, PORTLAND, SEATTLE, SPOKANE

"Check" Seal

Distributors for the Pacific Coast

Prompt and Reliable Deliveries

Anaconda Copper Wire and Strand is made from ore to finished product by the largest organization in the copper industry which exercises a coordinated control over every operation from the mining, smelting and refining of copper ore to the fabricating of Anaconda wire products.

This complete supervision insures users against delays in production. It insures a product of uniform excellence. From the standpoint of Pacific Coast buyers these advantages are further supplemented by the location and unexcelled shipping facilities of the Great Falls, Montana, Wire Mill.

These factors make it possible to insure quick deliveries of a reliable product to all Pacific Coast points.

ANACONDA COPPER MINING COMPANY
THE AMERICAN BRASS COMPANY

Rod, Wire and Cable Products

General Sales Office 25 Broadway, New York
Western Sales Office 111 W. Washington St., Chicago

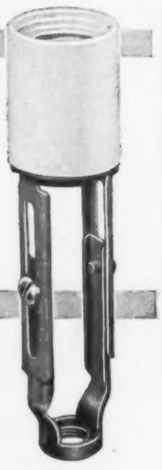
PACIFIC STATES
ELECTRIC COMPANY

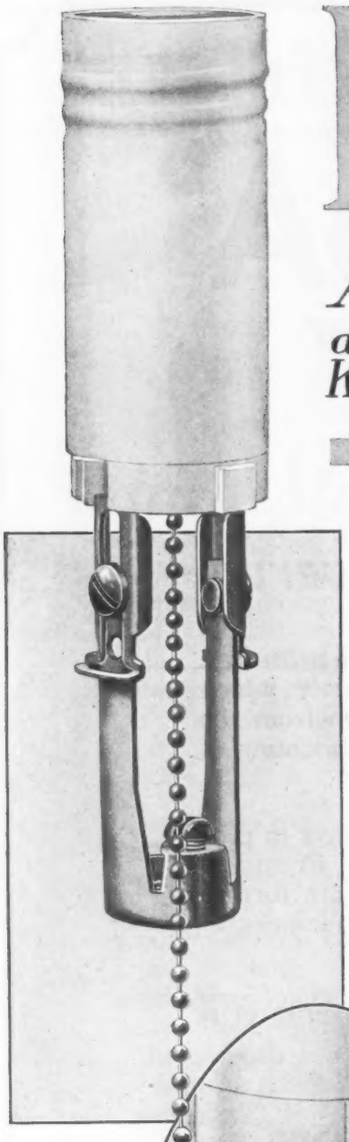
SAN FRANCISCO LOS ANGELES OAKLAND PORTLAND SEATTLE

Distributors for the Pacific Coast

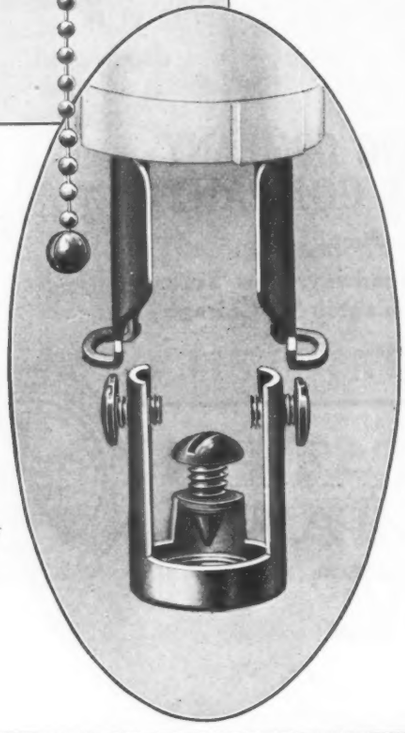
H&H new

Adjustable Pull and Keyless Candle Sockets





Above—Pull Socket Body No. 90 with yoke BY



At right—Manner of changing yokes

How Pull Body No. 90

fits every length candle and holder

First, it's shortened or lengthened by the adjusting arms, same as the now standard H&H Adjustable *Keyless* Socket. Second, it fits on to four different-length yokes—*each* of which gives a new range of adjustments.

Yokes are changed in a few seconds' time. Loosen the two adjusting screws and the yoke drops off. Push on a suitable size, slide it to the exact length required, set the screws and the job's done. Compared with fussing with one-arm hickies, you'll say that's *service*—H&H Service—where it *saves!*

Range of Adjustments

Yoke "BY", 2-inches long, meets most combinations of candle and candle holder. When attached to Body Part 90 (illustration at left), it's right for four-inch candles, having holders from 1-inch to 1 1/16-inches deep. It's further *adjustable* for 5-inch candles with holders flat to 1/16-inch deep.

Order a liberal stock of "BY" (2-inch) yokes. Then a few cartons of "AY" (1-inch), "CY" (3-inch) and "DY" (4-inch) yokes. You'll then be fixed to assemble fixtures with *any* length of candle holder—using 4, 5 *or* 6-inch candles. You'll save *time* beyond calculation, and

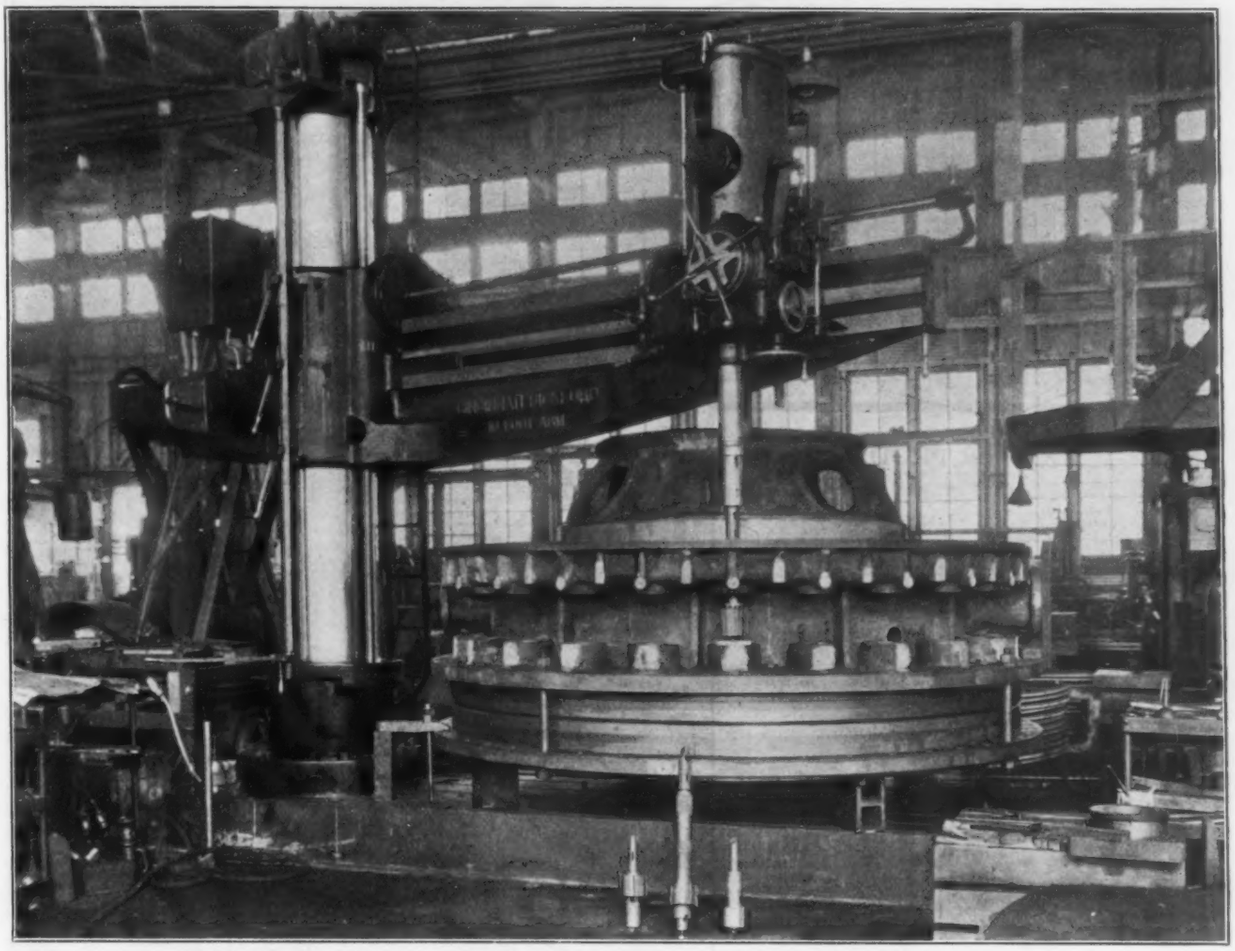
Lower Your Costs!

For more detailed description of this device, please write us.

THE HART & HEGEMAN MFG. CO.
HARTFORD, CONN.

PELTON

Pelton Manufacturing Accuracy



Radial drill recently installed by The Pelton Water Wheel Co., one of the largest of its type in the country.

The correct designing of hydraulic turbine equipment must be followed by the utmost accuracy in pattern and machine shop processes to insure high efficiencies and continuous, economical operation. This problem increases in importance as higher heads are developed and as units increase in size.

The illustration shows the ring cover for a 35,000 H. P. vertical reaction turbine on the bedplate of a 10′ radial drill. This modern tool not only produces the extreme accuracy required in this and similar operations but reduces production time to the minimum.

This drill is one of several machine tools recently installed in the Pelton works to insure the refinements that are characteristic of Pelton equipment as the sizes and capacities of hydraulic turbines are enlarged.

THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2985 Nineteenth St., SAN FRANCISCO **100 Broadway, NEW YORK**

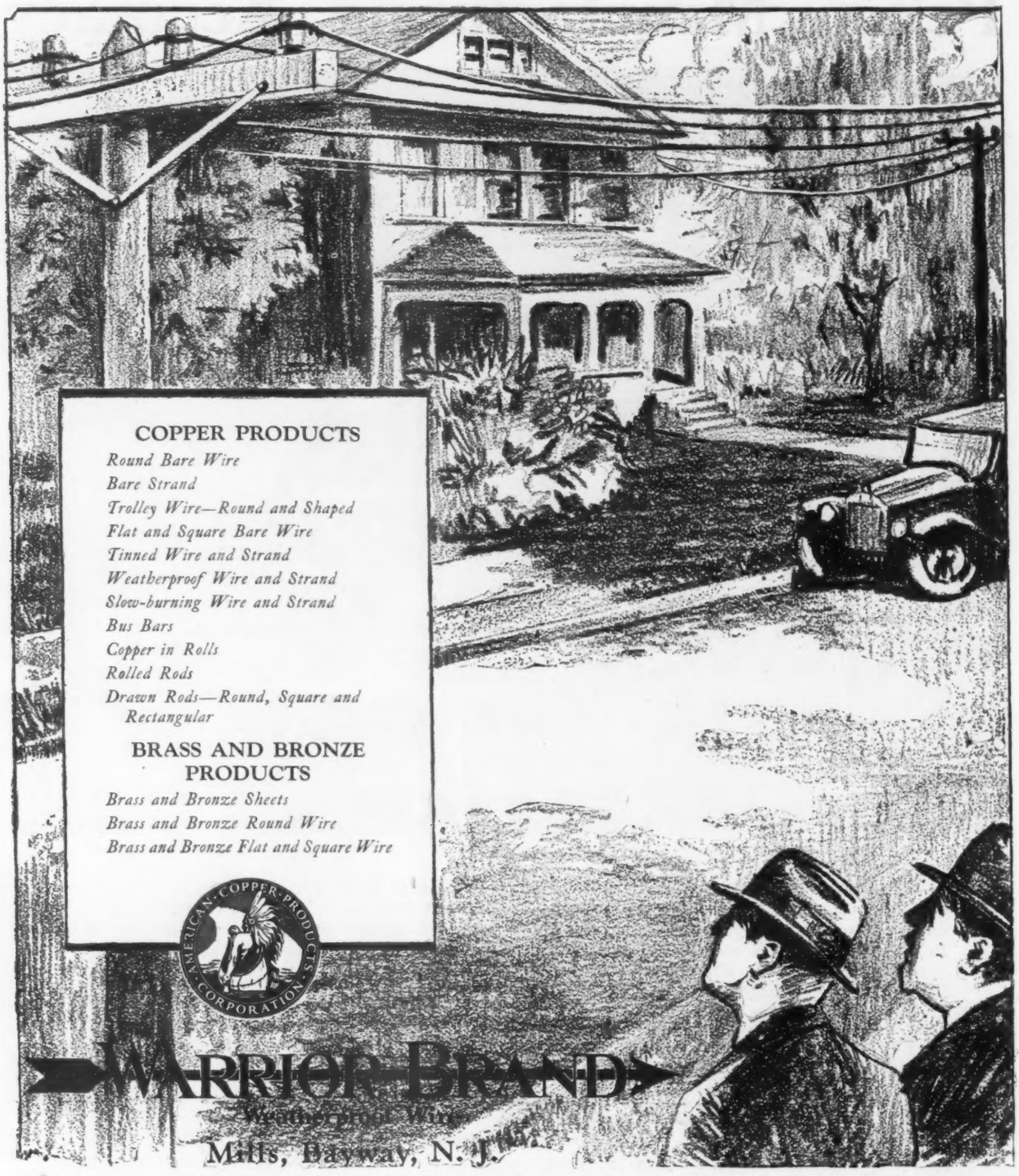
Divisional Office in American Trust Building, Birmingham, Ala.

Associated Companies: Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia; Dominion Engineering Works, Montreal; M. Hilpert & Co., Rio de Janeiro.

Pacific Coast Representatives: The M. W. Kellogg Co., Jersey City, N. J.; Larner Engineering Co., Philadelphia, Pa.; De La Vergne Machine Co., New York, N. Y.

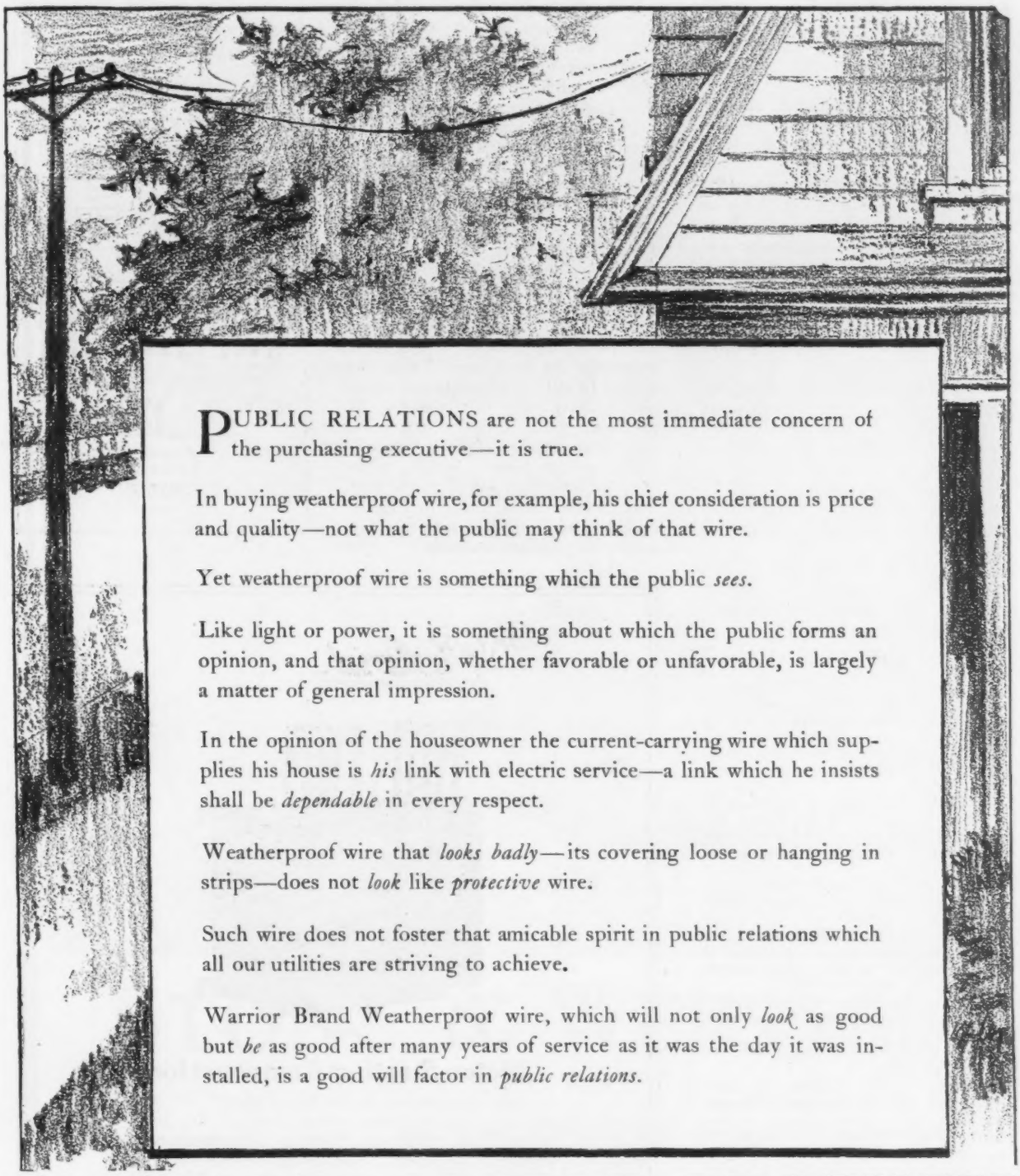
PELTON

RE: PUBLIC RELATIONS



AMERICAN COPPER PRODUCTS
CORPORATION
233 BROADWAY NEW YORK

AND WEATHER-PROOF WIRE



PUBLIC RELATIONS are not the most immediate concern of the purchasing executive—it is true.

In buying weatherproof wire, for example, his chief consideration is price and quality—not what the public may think of that wire.

Yet weatherproof wire is something which the public *sees*.

Like light or power, it is something about which the public forms an opinion, and that opinion, whether favorable or unfavorable, is largely a matter of general impression.

In the opinion of the houseowner the current-carrying wire which supplies his house is *his* link with electric service—a link which he insists shall be *dependable* in every respect.

Weatherproof wire that *looks badly*—its covering loose or hanging in strips—does not *look* like *protective* wire.

Such wire does not foster that amicable spirit in public relations which all our utilities are striving to achieve.

Warrior Brand Weatherproof wire, which will not only *look* as good but *be* as good after many years of service as it was the day it was installed, is a good will factor in *public relations*.

AMERICAN COPPER PRODUCTS CORPORATION
233 BROADWAY NEW YORK

THE PACKARD PAGE

Packard Motor Starting Compensators*

By R. W. BEARD

ONE of the most important adaptations of transformer principles is that of the Motor Starting Compensator generally used to limit the current drawn by industrial motors when starting up.

It is very generally understood that an idle motor when suddenly excited with full voltage will draw many times its normal current and the motor starting compensator is simply an auto transformer used to cut down the actual voltage impressed on the motor until the motor has reached sufficient speed to protect itself.

The Packard Electric Company has had on the market for many years a three phase, or two phase motor starting compensator of the two coil type, made for either 25 or 60 cycle and for any size motor between 10 and 2500 horsepower. Larger units can be taken care of by means of special design.

The general construction of the ordinary dry type starter is shown in Figure 1 and some of the outstanding features are as follows:

1. It is of the two coil type, making it extremely simple.
2. It is ordinarily provided with starting taps at 50, 65 and 80% of normal voltage, altho these values can be altered to suit particular requirements.
3. The unit is of three-legged design having two coils, one on either outside leg.
4. Each terminal is provided with duplicate terminal lugs, facilitating the making of a neat and workmanlike installation with a minimum of expense and trouble.
5. The steel used in the core of this type of equipment is of silicon content and will not overheat.
6. The unit is ruggedly mounted between heavy cast iron end plates, held between duplicate tie rods, which provide the means for convenient lifting.
7. Heavy slotted feet are provided to facilitate installing on either floor or wall, to be fastened by suitable bolts. The unit can be lowered into position after the bolts are in place.
8. Heavy copper windings are used with double cotton covered insulation and suitable spacing between layers is provided to enable the unit to stand repeated starting service and severe abuse, such as is frequently encountered in the industries.
9. A neat sheet steel housing of ample proportions is firmly clamped around the entire coil section, without interfering with ventilation, so that the coils are protected from mechanical injury.

Every care has been taken to make this unit the most rugged and the most easily installed compensator that it is possible to build.

On account of the fact that it is of two coil design, it can be used on either two or three phase motors. The connection for the usual three phase installation is shown in Figure 2. The switching arrangements for individual jobs may vary slightly in detail, but the general scheme as outlined above is usually adhered to.

All compensators are subjected to our regular transformer vacuum impregnating treatment to render the coil impervious to the entrance of moisture and on sizes approximately 1000 horsepower and below the entire element is subjected to this treatment. On units above 1000 horsepower the coils are impregnated separately and later assembled on the steel. In either case protection from deterioration, due to moisture, is obtained.

A large number of these compensators giving perfect service after years of operation attest to the fact that they are one of the most rugged, reliable and dependable starters for industrial purposes available.

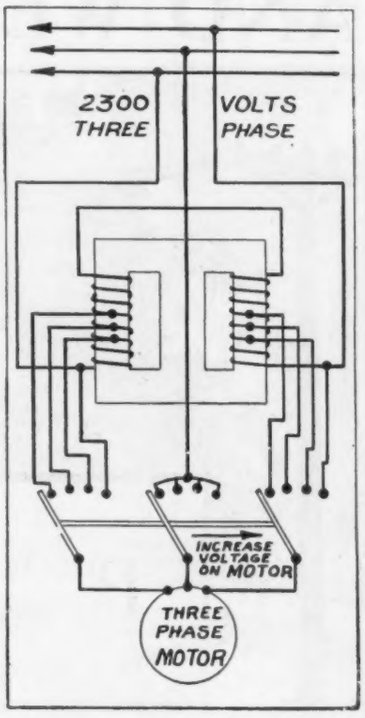


Fig. 2

The Packard

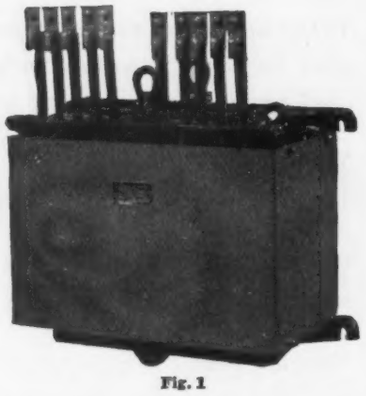


Fig. 1

Motor Starting Compensator

This illustration shows the Packard dry type starter. Several large motor builders are today using Packard Motor Starting Compensation as standard equipment. The perfect service they continue to give after years of operation PROVES that they are designed right and built right.

THE PACKARD ELECTRIC COMPANY, Warren, Ohio

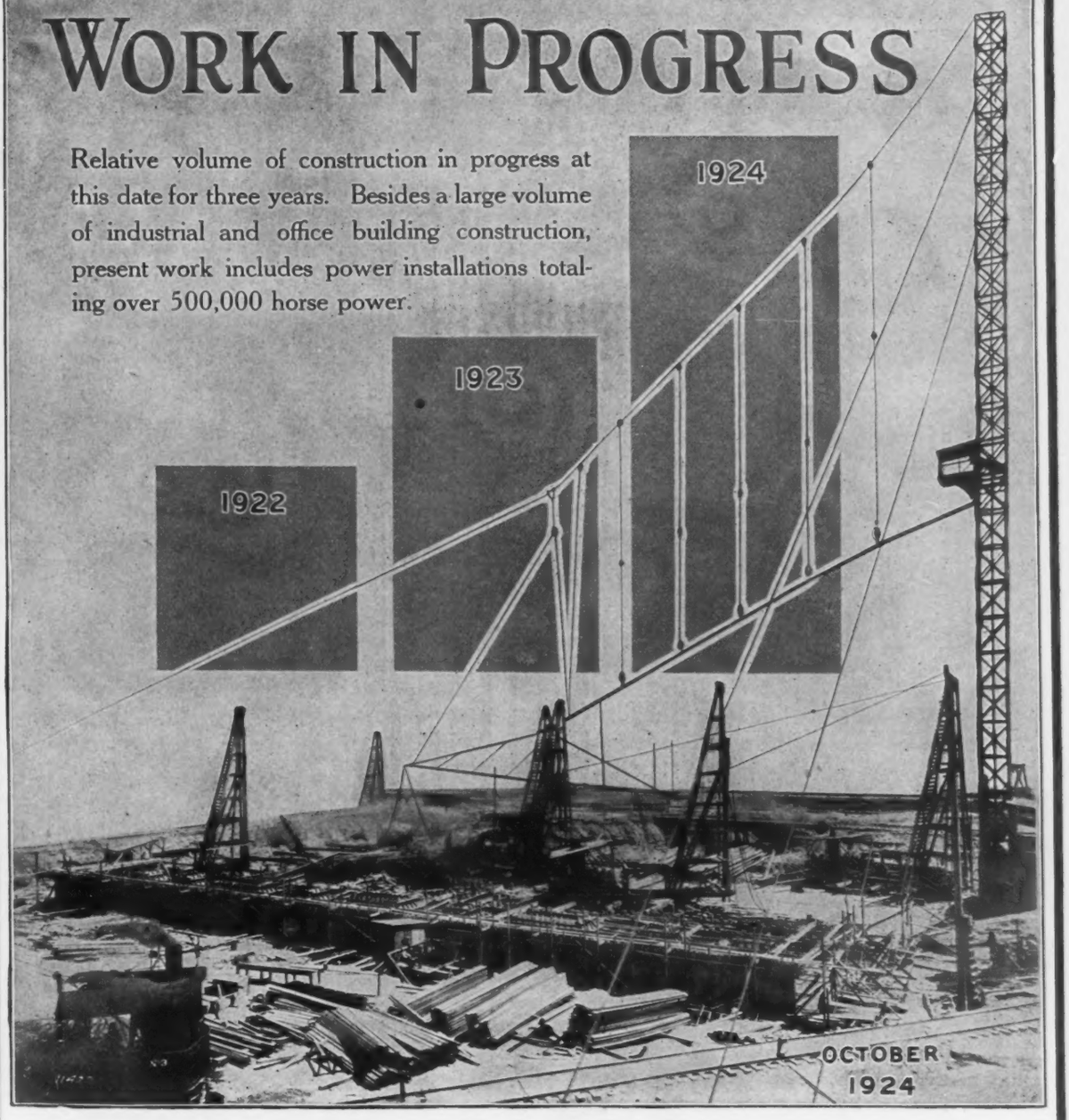
Transformer manufacturers since 1890

*Reprinted from Packard Doings (Monthly)

Western Representatives: San Francisco, H. B. Squires Co., 583 Howard St.; Los Angeles, W. W. La Barr, 126 W. Third St.; Seattle, Burton R. Stare, 619 Fourth Ave.

WORK IN PROGRESS

Relative volume of construction in progress at this date for three years. Besides a large volume of industrial and office building construction, present work includes power installations totaling over 500,000 horse power.



STONE & WEBSTER

INCORPORATED

DESIGN · BUILD
OPERATE
FINANCE

NEW YORK, 120 Broadway
SAN FRANCISCO, Holbrook Bldg.
BOSTON, 147 Milk Street
CHICAGO, 38 S. Dearborn Street
PHILADELPHIA, Real Estate Trust Bldg.

Accurate periodic meter tests prevent revenue losses and maintain good will

PERIODIC meter testing is one of the most important factors in modern central-station management. It eliminates losses of revenue due to meters running slow and it helps to preserve that invaluable asset, public good will, which is quickly destroyed if meters run fast.

Portable test meters used for this purpose must be of high initial accuracy and must maintain their permanence of calibration under all conditions of service.

Sangamo Alternating-current Portable Test Meters meet these vital requirements. Among their important features are the following:

Standard Parts—The moving system is essentially the same as that which has proved so successful in standard Sangamo Type H Meters. The only changes are modifications in the windings to obtain the various current and potential ranges of the standard.

Minimum Friction—All moving parts, even in the register, operate in jewel bearings. The main spindle is held in position by a ring jewel where it passes through the train plate.

Three-pointer Register—The largest circle represents a single revolution of the disk and is divided into hundredths. The two small pointers make one revolution for each 10 and 100 revolutions of the disk respectively.

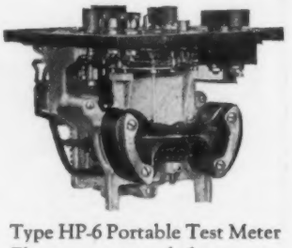
Reset Button—Enables all hands to be instantly reset to zero.

Voltages—The meters are arranged for 110 and 220-volt operation, the changes from one voltage to another being accomplished by means of a rotating switch. When additional voltage ranges are required, multipliers are used.

Current Ranges—The HP-2 is offered with 1 and 10-ampere current coils as standard but will be furnished with 1 and 5-ampere coils or 5 and 10-ampere coils, if specified. The HP-3, recently developed, is equipped with 1, 10 and 25-ampere coils as standard but will be furnished with 1, 5 and 15-ampere coils if specified.

The HP-6 meter has six current ranges—1-5-10-25-50 and 100 amperes. Changes from one current range to another are effected by means of a drum controller. Multiple-leaf brushes bearing down heavily on two sides of a flat disk are used for the higher capacities, giving a high-pressure contact of great area. For the lower capacities the usual leaf brush is used.

Sangamo Type HP-6 Portable Test Meter.



Type HP-6 Portable Test Meter Element removed from case.

Write for folder describing and illustrating these meters.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

New York Chicago Birmingham San Francisco Los Angeles

SANGAMO METERS

FOR EVERY ELECTRICAL NEED

6720-1

Locke Insulators are Sure of Themselves

THE workman who flirts with death on the pinnacle of the Woolworth tower by trusting his hold to the reliability of steel supports, is merely dealing with *known factors of security*.

But the most essential factor is confidence in himself. He is not so much performing a "stunt" as he is emphasizing the exact co-ordination of mind, muscle and material upon which depend his safety in the daily task.

The inter-dependence of metal parts with porcelain units in strings, bears a close analogy to the above illustration. From the line suspension clamp (upon which the "foot of the insulator" rests) to the hook or other connecting device with the steel tower, each piece of hardware and porcelain must perform its function dependably. Contraction and expansion, without injury to the porcelain, must be provided for in the design and assembly of materials.

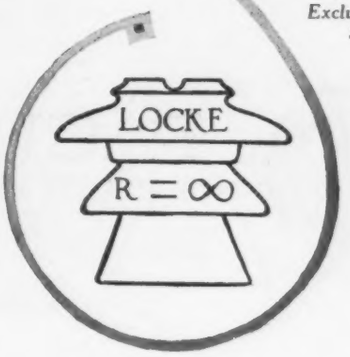
In all these particulars Locke Insulators are the products of skilled co-ordination of inter-related parts—an accomplishment which is realized only through many years of specialized experience.

Locke Insulators can be relied upon at all times—however hazardous the situations they meet in the daily performance of duty.

LOCKE INSULATOR CORPORATION
Baltimore, Md., and Victor, N. Y.

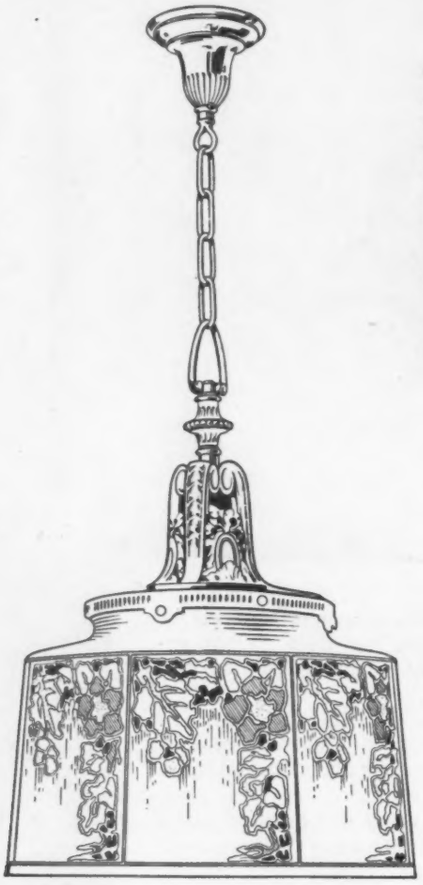
LOCKE
PORCELAIN

PACIFIC STATES
ELECTRIC COMPANY
San Francisco Oakland
Los Angeles Portland
Seattle Spokane
Exclusive Pacific Coast Sales Agents



Get Your Share of the
Residential and Commercial Lighting Market

In every town in this territory, seven out of ten stores are poorly lighted—two out of three cafes are gloomy—every other school is under lighted—four out of five business offices have had bad lighting that causes errors and eyestrain. Now is the time to go after this business!



Every wired home in the cities in this territory averages twenty-two Mazda Lamp sockets each. There is a chance to sell the right Edison Mazda Lamp for a lot of those sockets. Also eleven of these twenty-two sockets could better satisfy the householder from the viewpoint of decoration if they were equipped with Ivanhoe Rozelle decorative glassware.

Ivanhoe Ace Lighting Fixture for commercial lighting

G-E Edison Mazda Lamps in types and sizes for every purpose

Holophane Reflector for store and window lighting

Wahle Wall Brackets with Rozelle Glass Shades

There is an enormous market for better dining room lighting. According to the best home lighting figures available, 50% of the wired homes in this territory are logical prospects for Ivanhoe Ivadine, pictured above. Ask for details of complete plan to help you sell them.

"Check" Seal

PACIFIC STATES
ELECTRIC COMPANY

SAN FRANCISCO, LOS ANGELES, OAKLAND, PORTLAND, SEATTLE, SPOKANE

"Check" Seal

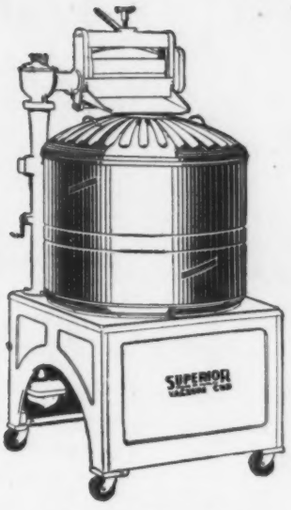
Exclusive Pacific Coast Sales Agents

Sell Hurleys for Christmas—

Hurley Thor 32
$175.00 list.

A type for
every need
a
Price for
every purse

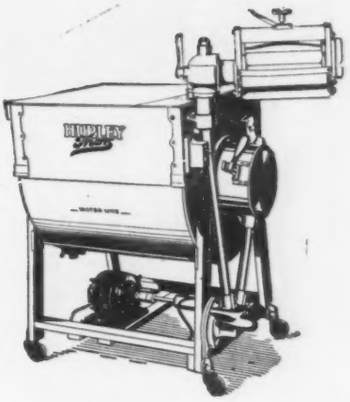
Hurley Superior
Oscillator
$121.50 list.



Hurley Superior
Vacuum Cup
$150.00 list.

Irons Shirts, Dresses
Everything in the family ironing

Hurley Thor
Home Ironer
$180.00 list.



Hurley Thor 25
$145.00 list.

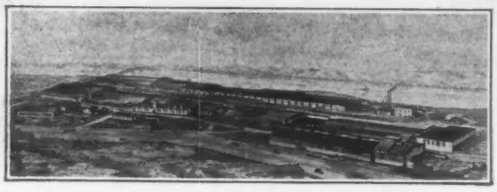
"Check" Seal

PACIFIC STATES
ELECTRIC COMPANY

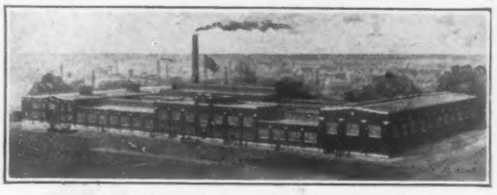
SAN FRANCISCO, LOS ANGELES, OAKLAND, PORTLAND, SEATTLE

Exclusive Pacific Coast Sales Agents

"Check" Seal



THE HUBBARD PITTSBURGH PLANT
Started in 1843
Output 30,000 tons Hubbard Galvanized Pole Line Hardware,
5,000,000 Peirce Pins, Racks and Brackets



THE HUBBARD CHICAGO PLANT
Started in 1921
Output 14,000 tons Hubbard Galvanized Pole Line Hardware,
1,000,000 Peirce Pins

THE HUBBARD NILES PLANT
Started in 1923
Output 2,500,000 Peirce Wireholders, Brackets, Mast Arms

Announcing a NEW HUBBARD FACTORY

TO meet the growing demand for Hubbard Pole Line Hardware and Peirce Specialties on the Pacific Coast and to give the great Power Companies of the Coast the service which their remarkable growth demands, Hubbard & Company on September 1st began the construction of a modern Pole Line Hardware plant at Emeryville, California, which will be in operation the last week of October.

Mr. Richard M. Kerschner, formerly Chief Engineer of Hubbard & Company, Pittsburgh, has moved to the Coast and has taken up his new duties as Coast Manager, directing manufacturing and sales on the Coast. Sales will be made exclusively through the Hubbard Coast Distributors, Pacific States Electric Company and Western Electric Company.

HUBBARD *and company*

PITTSBURGH CHICAGO

Here is Genuine Proof!!
NEARLY everybody knows that brass is made of copper and zinc, alloyed together under an intense heat—much in the same manner as the permanent zinc coat of Sherarduct is alloyed with the steel pipe. To prove the point, this copper disc was placed in a Sherardizing furnace and put through the same treatment as Sherarduct. The zinc coating is alloyed with the copper, as you will note by the brass that formed between the copper and zinc.
Convincing evidence, isn't it, that Sherarduct is rust-proof; that the zinc coat of Sherarduct will not rub off, crack or peel; that Sherardizing really alloys the zinc with the spelterized steel pipe of which Sherarduct is made. Besides, the intense heat through which Sherarduct passes anneals the pipe and makes it easier to bend on the job.
National Metal Molding Co.
Pittsburgh, Pa.
World's largest manufacturers of Electrical Conduits and Fittings

See for yourself how ***Sherardizing*** *alloys!*

Pocket Evidence---Free

WHEN the proper metals meet and mix there is created new strength, new power of resistance—to rust, to corrosion, to time itself.

On the steel pipe of **Sherarduct** the heavy covering becomes an inseparable part of the conduit. **Sherardizing** alloys the metals. See the point of fusion in the free pocket token, how the copper and zinc unite and form brass. The zinc coating of **Sherarduct** is a part of the conduit—inseparable, irremovable. Ductile, rustless **Sherarduct** makes any conduit job a better job.

¶ *Send the convenient coupon—see for yourself how* **Sherardizing** *alloys with the steel pipe*

National Products

NATIONAL RIGID CONDUIT
For high grade wiring

SHERARDUCT — *Protected by both zinc and enamel*
ECONOMY — *Protected by enamel only*

FLEXSTEEL ARMORED CABLE and CONDUIT
For high class work at minimum cost

FLEXTUBE NON-METALLIC CONDUIT
For knob and tube wiring and the like

NATIONAL METAL MOLDING and FITTINGS
For circuit extensions and surface wiring

NATIONAL INSULATING BRACKETS
For service entrances and similar uses

NATIONAL CONDUIT and CABLE FITTINGS
Locknuts—Bushings—Box connectors and other items

NATIONAL OUTLET BOXES
a box or cover for every need

LIBERTY WIRES, CABLES and CORDS
For 600 volts or less

LIBERTY AUTOMOBILE WIRE
AUTO-STEELFLEX METAL CONDUIT
For the electrical circuits of motor vehicles

NATIONAL CARBURETER, HEATER and EXHAUST TUBING
For motor vehicles

National Metal Molding Company

WORLD'S LARGEST PRODUCERS OF ELECTRICAL CONDUITS AND FITTINGS

1132 **Fulton Building, Pittsburgh, Pa.**

Represented in All Principal Cities [14]

Sherarduct

The Rigid Conduit That Bends

SIGN—TEAR OFF AND MAIL TODAY

National Metal Molding Company
Pittsburgh, Pa.

Please send free pocket token demonstrating the results of **Sherardizing.**

Name _____

Firm _____

Address _____

This is the sixth of a series of talks on Duncan meters, and emphasizes the fact that

DUNCAN design reduces meter maintenance to its simplest elements

Illustrated above is the entire equipment required by the meter maintenance man in doing all the work necessary to keep Duncan meters in excellent working condition (short of sending them back to the factory for calibration or major repairs). Any adjustment light or heavy load phase or power factor as well as the complete dismounting of the grid or removing any of the coils, can be done with an ordinary screwdriver (C).

When the jewel post is taken out for inspection or cleaning, every two or three years, the pivot, being very inexpensive, is usually replaced. The old pivot is easily withdrawn and the new one inserted by means of the pivot puller (B).

We have always advocated careful cleaning of the bearings and for this we provide clean, dry corn pith (A). Its use facilitates also the removal of dust from gear teeth and similar places of small clearance.

Duncan oil (E) is a pure mineral oil highly refined and chemically stable. Its freezing point is about 25 deg. F. below zero and its viscosity curve is relatively flat. It does not become rancid and retains its protective powers for long periods of time. It is especially valuable in the lower jewel bearing of watthour meters, where it tends to prevent rusting of the steel pivot and thus greatly prolongs the life of the jewel.

The separable potential electro-magnet coils (D) make possible replacements of burned coils (usually only one is affected) at the moderate cost of thirty cents.

Making maintenance easy insures its being done. The small outfit shown is indicative of the small amount of maintenance required by Duncan meters, which is eloquent of the lasting qualities of Duncan engineering and construction.

DUNCAN ELECTRIC MANUFACTURING CO. • LAFAYETTE, IND. •

Help 100,000 Destitute Children on "Golden Rule Sunday"

On Sunday, December 7th, there will be a world-wide observance of the Golden Rule—

"Whatsoever ye would that men should do to you, do ye even so to them."

The thousands of people who observe Golden Rule Sunday will eat on that day a meal of soup, bread, stewed fruit and cocoa. As they eat that simple meal, they will put themselves in the place of the thousands of orphan children who lack even such food. These men and women will remember the Golden Rule and give their contributions to buy food for the 100,000 hungry children in the Near East—fatherless, homeless and destitute children in Greece, Syria, Palestine and Armenia.

The lasting joy that comes from a simple act of kindness—an observance of the Golden Rule—can be yours, too. Every dollar you give to the Near East will buy twenty dinners of soup, bread, rice and cocoa for the Near East orphans. And $100 a year will feed, clothe and educate one of these children.

Remember The Golden Rule
On December 7th

To
CLEVELAND H. DODGE,
Treasurer
Near East Relief, 151 Fifth Ave.,
New York City

To help one of the orphaned children in the Near East under your care, I enclose

$.....

NAME .....

ADDRESS .....

No. 1080
Locatap

No. 122
Duolet

No. 77
Localet

Dealers everywhere report big sales. The Piedmont Electric and Hdwe. Co., Oakland, Cal., says: "We have already ordered over $200 worth of Benjamin Two-Ways assorted in the last two months."

There is still another chance to cash in big on Christmas Sales of Benjamin Two-Way Plugs and other appliances and win one of the fine merchandising prizes in the

Benjamin Two-Way Plug Prize Window Contest

Every dealer is eligible. Send now for your Christmas Window Trim. It will help you make December the biggest month of the year in sales of Benjamin Two-Way Plugs and other appliances.

Benjamin Electric Mfg. Co.

120-128 So. Sangamon St., Chicago
247 W. 17th St., New York 448 Bryant St., San Francisco

BENJAMIN
Makers of Things More Useful

Should Motor Dealers Carry Stocks of Pulleys?

CAN ANY motor dealer afford to carry 2186 different pulley sizes in stock? *Certainly not!*

Such a stock would cost him $10,000. He cannot afford to tie up so much money in a slow moving item like pulleys. And yet, years of experience have shown us that 2186 sizes are necessary to cover the range from 2″ to 14″ diameters—in the more commonly used sizes.

Any stock that a dealer *might* afford to carry —300 or 400 pulleys—*falls far short* of being adequate. And it usually results in re-boring and turning down, which only increase the cost of the pulley to the customer.

What, then, is the solution to the problem? How is the motor dealer to supply the pulleys his customers require—and without delay?

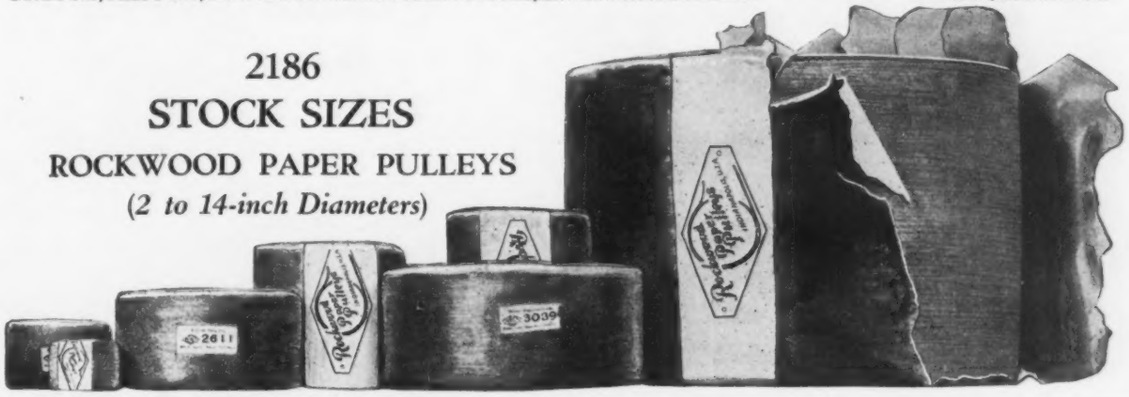
The chain of Rockwood Paper Pulley Warehouses from coast to coast is the answer. In these warehouses, we carry the range of 2186 different sizes of Rockwood Paper Pulleys from 2″ to 14″ diameters—ready for immediate demand.

With this service, it is just as though every dealer in the United States had this enormous stock in his own store room. Now motor dealers can sell paper pulleys without any money tied up in stock.

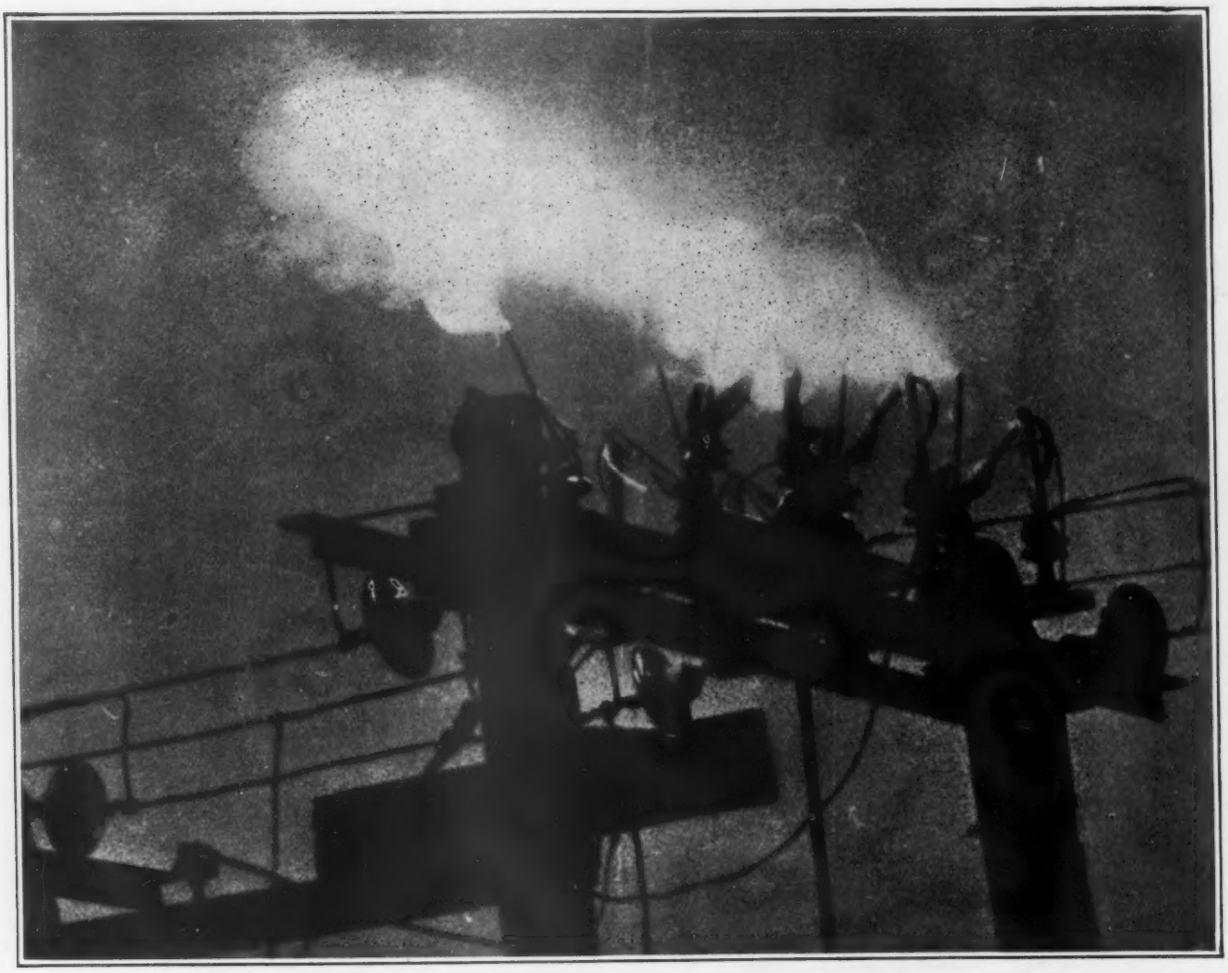
Order from the warehouse nearest you, giving diameter of pulley, width of belt to be used, shaft size and dimensions of keyway in shaft.

BOSTON, MASS., ROCKWOOD PAPER PULLEY STORES, Inc., Olmsted-Flint Company, Cambridge - - - - *All Sizes 2 to 14 in. dia.*
CHICAGO, ILL., ROCKWOOD PAPER PULLEY STORES, Inc., Chicago Electric Company, 740 W. Van Buren St. - *All Sizes 2 to 14 in. dia.*
CINCINNATI, O., ROCKWOOD PAPER PULLEY STORES, Inc., The Doermann-Roehrer Co., 450-456 East Pearl St. - *All Sizes 2 to 10 in. dia.*
CLEVELAND, O., ROCKWOOD PAPER PULLEY STORES, Inc., The Strong, Carlisle & Hammond Co., 1394 W. Third St. *All Sizes 2 to 14 in. dia.*
DENVER, COLO., ROCKWOOD PAPER PULLEY STORES, Inc., The Hendrie & Bolthoff Mfg. & Sup. Co., 1635 17th St. *All Sizes 2 to 8 in. dia.*
DETROIT, MICH., ROCKWOOD PAPER PULLEY STORE, Inc., Spaulding Electric Company, 1344-1346 Michigan Ave. *All Sizes 2 to 14 in. dia.*
INDIANAPOLIS, IND., ROCKWOOD PAPER PULLEY STORES, Inc., 1801 English Avenue - - - - - *All Sizes 2 to 14 in. dia.*
KANSAS CITY, MO., ROCKWOOD PAPER PULLEY STORES, Inc., Webb Belting Company, 1501 West Twelfth St. *All Sizes 2 to 10 in. dia.*
LOS ANGELES, CAL., ROCKWOOD PAPER PULLEY STORES, Inc., Illinois Electric Company, 313 S. San Pedro St. *All Sizes 2 to 14 in. dia.*
NEW YORK CITY, ROCKWOOD PAPER PULLEY STORES, Inc., W. A. Jones Fdy & Machine Co., Church and Murray Sts. *All Sizes 2 to 14 in. dia.*
PHILADELPHIA, PENN., ROCKWOOD PAPER PULLEY STORES, Inc., Charles Bond Company, 617 Arch St. - - *All Sizes 2 to 14 in. dia.*
PITTSBURGH, PENN., ROCKWOOD PAPER PULLEY STORES, Inc., Transmission & Belting Co., 325 Second Ave. - *All Sizes 2 to 14 in. dia.*
SALT LAKE CITY, UTAH, ROCKWOOD PAPER PULLEY STORES, Inc., Capital Electric Co., 310-314 W. Second South St. *All Sizes 2 to 8 in. dia.*
SAN FRANCISCO, CALIFORNIA, BUZZELL ELECTRIC WORKS, 532 Sansome St. - - - - - - - *Most Sizes 2 to 14 in. dia.*
SEATTLE, WASH., ROCKWOOD PAPER PULLEY STORES, Inc., Seattle Hardware Co., 501 First Ave. South - *All Sizes 2 to 14 in. dia.*
ST. LOUIS, MISSOURI, ROCKWOOD PAPER PULLEY STORES, Inc. 801 North Second Street - - - - - *All Sizes 2 to 14 in. dia.*

2186
STOCK SIZES
ROCKWOOD PAPER PULLEYS
(2 to 14-inch Diameters)



THE ROCKWOOD MANUFACTURING CO - Indianapolis, Ind.



Look where the arc breaks—

ELPEC

ELECTRIC POWER EQUIPMENT CORPORATION

412-420 NORTH EIGHTEENTH ST. PHILADELPHIA, PA.

Electrical Engineering & Mfg. Co.
907 Penn Avenue,
Pittsburgh, Pa.

Electrical Engineering & Mfg. Co.,
320 Union Building,
Cleveland, Ohio.

Electrical Engineering & Mfg. Co.,
607 Mercantile Library Building,
Cincinnati, Ohio.

J. W. Fraser & Co.,
615 Commercial Bank Building,
Charlotte, N. C.

E. A. Thornwell,
Candler Building,
Atlanta, Ga.

Captain Harold E. Bell,
19 Rorvik Ave.,
Durban, So. Africa.

Mr. J. J. Costello,
201 Devonshire St.,
Boston, Mass.

Mr. G. A. Brewer,
330 Crown St.,
New Haven, Conn.

Eicher & Bratt,
570 Colman Building,
Seattle, Washington.

Goodyear & Hammersley, Inc.,
36 Church Street,
New York, N. Y.

Mr. L. T. Hall,
P. O. Box 394,
Huntington, W. Va.

Mr. O. T. Hall,
1926 Edmondson Avenue,
Baltimore, Md.

C. E. Ingalls,
Rialto Building,
San Francisco, Cal.

A. L. Searles,
Michigan Trust Building,
Grand Rapids, Mich.
and
715 Dime Bank Building,
Detroit, Mich.

E. E. Van Cleef,
53 W. Jackson Blvd.,
Chicago, Ill.

Nathan & Allen Ltd.,
25 Victoria St.,
Westminster, S.W.1. London.

Mr. C. M. Fergusson,
Dwight Bldg.,
Kansas City, Mo.

Rumsey Elec. Co.,
1007 Arch St.,
Philadelphia, Penna.

W. T. White & Co.,
Metropolitan Life Building,
Minneapolis, Minn.

R. L. Johnstone,
611 Granite Building,
4th & Market Sts., St. Louis, Mo.

Ferguson Engineering Co.,
312 N. Harwood St.,
Dallas, Texas.

Ferranti Meter & Trans. Mfg. Co.,
26 Noble St.,
Toronto, Canada.

Ferranti Meter & Trans. Mfg. Co.,
128 Bleury St.,
Montreal, Canada.

Ferranti Meter & Trans. Mfg. Co.,
145 Market St.,
Winnipeg, Man.

916 Standard Bank Bldg.,
Vancouver, B. C.

One of the reasons why Elpeco Air Break Switches are being more widely used every day is shown by the arc breaking right at the tips of the horns

—away above the equipment

—out of harm's way.

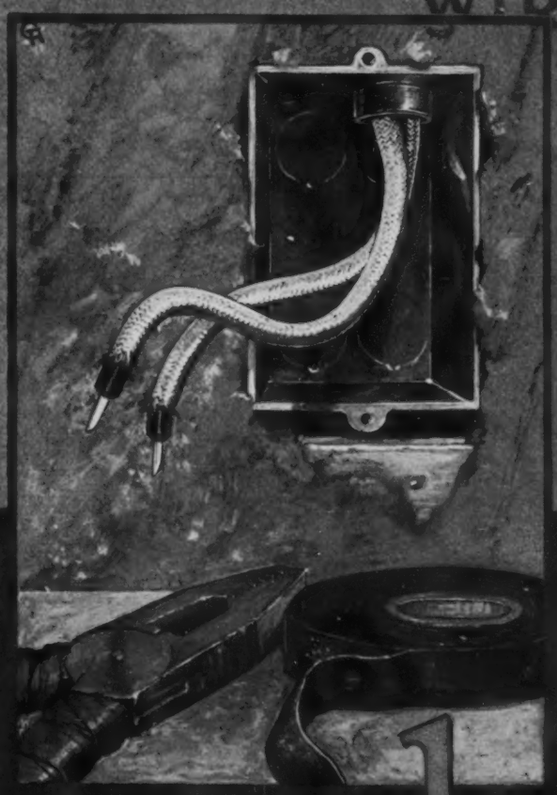
Probably no development of recent years has been more widely accepted than the Elpeco Air Break Switch.

for the good of the Service ELPEC

Western Representatives: C. E. INGALLS, Rialto Bldg., San Francisco, Cal.; EICHER & BRATT, 570 Colman Bldg., Seattle, Wash.

ROME WIRE

WIRE: ROME



code

Rome Code Wire Means—

—uniformly, well tinned copper for easy soldering,
—tough, live, free stripping rubber insulation,
—tight, clean braid that cuts cleanly and does not slip,
—a smooth wax, with no lumps, that makes fishing easy.

A uniformly good wire

An eighteen acre unit controlled plant insures uniform quality and real service

ROME WIRE COMPANY Mills and Executive Offices: ROME, N. Y.
Diamond Mills, BUFFALO, N. Y.

NEW YORK 50 Church St.
BOSTON Little Bldg.
CHICAGO 14 E. Jackson Blvd.
CLEVELAND 1200 W. Ninth St.
DETROIT 25 Parsons St.
LOS ANGELES, J. G. Pomeroy, 336 Azusa Street

"It couldn't be done"

—but it was *!*—

Two years ago the German Loan looked hopeless. Today it is a reality. Over-subscribed in fifteen minutes.

Likewise with an air break switch mounted on a single wood pole! They said it couldn't be done but here it is—the Elpeco R-2 Air Break for Sectionalizing—so mounted. **Two insulators per phase on switch!** Connections made direct from transmission line. Simple! Easy to install! All principles of the Elpeco Air Break Switch, in that both insulators per phase on switch rotate and throw arc upwards. Check up this switch. Get in touch with nearest representative. See list below.

ELPEC

ELECTRIC POWER EQUIPMENT CORPORATION

412-420 NORTH EIGHTEENTH ST. PHILADELPHIA, PA.

Electrical Engineering & Mfg. Co., 907 Penn Avenue, Pittsburgh, Pa.

Electrical Engineering & Mfg. Co., 320 Union Building, Cleveland, Ohio.

Electrial Engineering & Mfg. Co., 604 Mercantile Library Building, Cincinnati, Ohio.

J. W. Fraser & Co., 605 Commercial Bank Building, Charlotte, N. C.

E. A. Thornwell, Candler Building, Atlanta, Ga.

Captain Harold E. Bell, P. O. Box No. 7111, Johannesburg, S. A.

H. I. Skilton, 516 National Bank Bldg. Havana, Cuba.

Mr. J. J. Costello, 201 Devonshire St., Boston, Mass.

Mr. G. A. Brewer, 330 Crown St., New Haven, Conn.

Eicher & Bratt, 570 Colman Building, Seattle, Washington.

Nathan & Allen Ltd., 25 Victoria St., Westminster, S. W. 1, London.

Goodyear & Hammersley, Inc., 30 Church Street, New York, N. Y.

DISTRICT REPRESENTATIVES:

Mr. L. T. Hall, P. O. Box 394, Huntington, W. Va.

Mr. O. T. Hall, 1926 Edmondson Avenue, Baltimore, Md.

Mr. C. E. Ingalls, Rialto Building, San Francisco, Cal.

Mr. R. L. Johnstone, 611 Granite Bldg., 4th & Market Sts. St. Louis, Mo.

Ferguson Engineering Co., 312 N. Harwood St., Dallas, Texas.

Ferranti Meter & Trans. Mfg. Co., 26 Noble St., Toronto, Canada.

Ferranti Meter & Trans. Mfg. Co., 128 Bleury St., Montreal, Canada.

Ferranti Meter & Trans. Mfg. Co., 145 Market St., Winnipeg, Man.

916 Standard Bank Bldg., Vancouver, B. C.

Mr. C. M. Fergusson, Dwight Bldg., Kansas City, Mo.

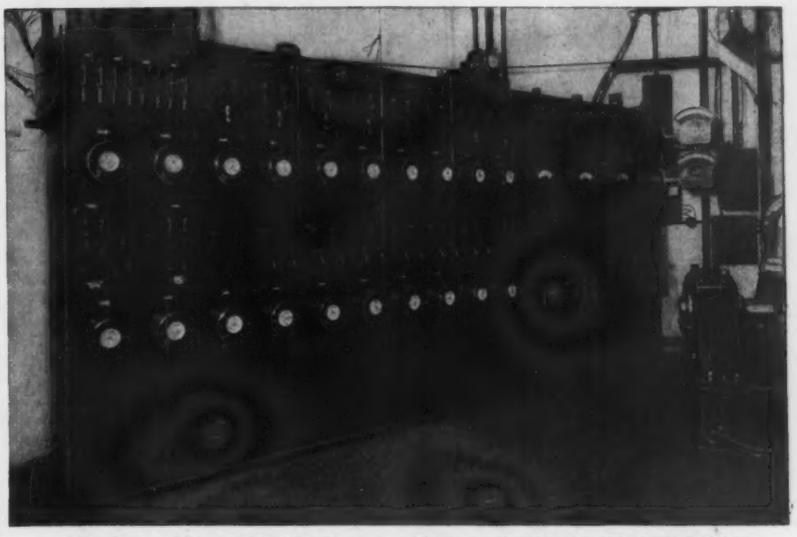
Rumsey Elec. Co., 1007 Arch St., Philadelphia, Penna.

W. T. White & Co., Metropolitan Life Building, Minneapolis, Minn.

Mr. A. L. Searles, Michigan Trust Building, Grand Rapids, Mich.
and
808 Donovan Bldg., 2457 Woodward Ave. Detroit, Mich.

Mr. E. E. Van Cleef, 53 W. Jackson Blvd., Chicago, Ill.

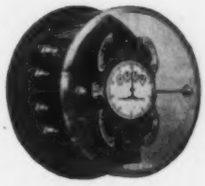
SANGAMO



An Installation of Sangamo Type-D5 Direct-current Meters on Switchboard of Equitable Building, Denver, Colorado

Sangamo switchboard meters

High sustained accuracy simplicity and accessability



Sangamo Polyphase Switchboard-type Watthour Meter

Sangamo Two-wire, Direct-current Switchboard-type Watthour Meter

HIGH sustained accuracy is without question the most important consideration in meters of all kinds. Sangamo switchboard meters meet this essential requirement to a degree that is never surpassed and at the same time have that durability and simplicity of construction, ease of adjustment and accessibility of parts which mean so much to economy in meter maintenance.

The Sangamo line is complete, including single and polyphase watthour meters, two and three-wire direct-current watthour meters and amperehour meters to meet every need.

Direct-current meters are of the mercury-motor type which far excels all other types in durability, simplicity and staunchness of construction. Alternating-current meters are of the split-phase induction type with many refinements which give them unsurpassed electrical characteristics on varying loads, voltage and power-factor.

It is because Sangamo Switchboard-type Meters meet so well the exacting requirements of power-plant installations that they have met with widespread use both in America and abroad.

Bulletin No. 57 lists a number of the more prominent generating plants in which Sangamo Switchboard Meters are used and describes the various types in detail. Shall we send you a copy?

Sangamo Electric Company
Springfield, Illinois

New York Chicago Birmingham San Francisco Los Angeles

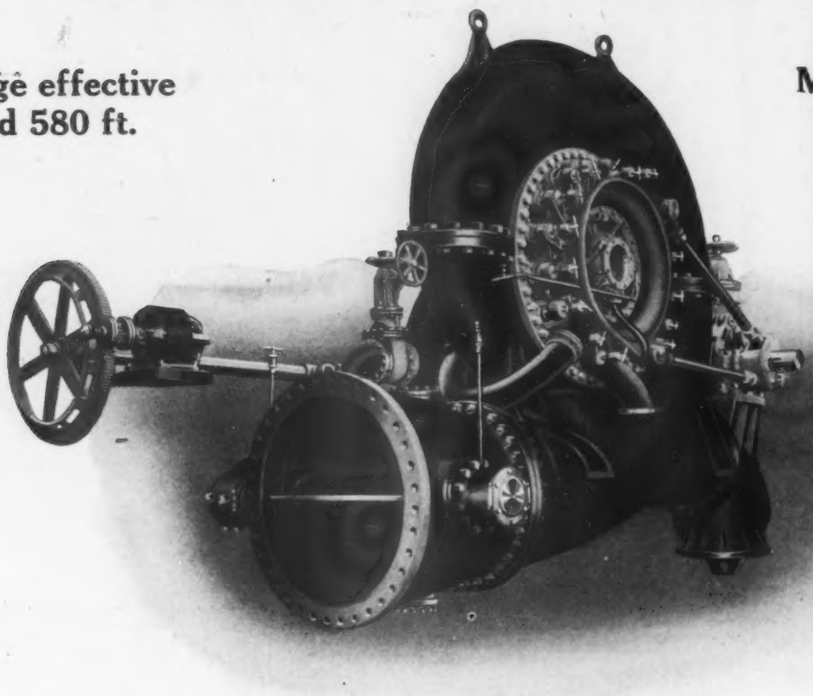
SANGAMO METERS
FOR EVERY ELECTRICAL NEED

6920-1

PELTON

Pelton Single Overhung Reaction Turbine with Official Test Curves

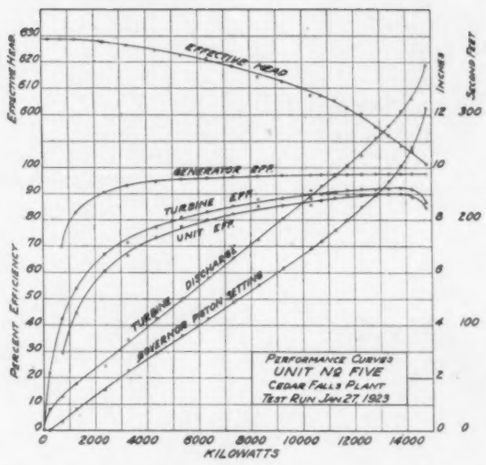
Average effective Head 580 ft.



Maximum output 20,000 H. P.

The turbine illustrated is a single overhung Pelton reaction unit of the two bearing type designed and built for the Cedar Falls Extension plant of the City of Seattle. Official tests were conducted on January 27, 1923, approximately one year after the unit had been placed in operation, the result of which showed a maximum turbine efficiency of 93%, a margin of 7% over the conservative guarantee made by Pelton engineers. The curves are reproduced from the annual report of the Department of Lighting, City of Seattle, issued in 1923.

The shaft and bearings were built by the turbine manufacturer, the usual procedure followed in units of the two bearing type. The outboard bearing is designed to carry its share of the rotating weight and also to withstand maximum end thrust in either direction.



THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2985 Nineteenth St., SAN FRANCISCO **100 Broadway, NEW YORK**

Divisional Office in American Trust Building, Birmingham, Ala.

Associated Companies: Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia; Dominion Engineering Works, Montreal; M. Hilpert & Co., Rio de Janeiro.

Pacific Coast Representatives: The M. W. Kellogg Co., Jersey City, N. J.; Larner Engineering Co., Philadelphia, Pa.; De La Vergne Machine Co., New York, N. Y.

PELTON

PACIFIC
COAST PRODUCTS
FOR
PACIFIC COAST USERS

PAYNE'S
POLE LINE
HARDWARE
HOT GALVANIZED
AND PLAIN
Made on the Coast

ADEQUATE STOCKS OF ALL STANDARD ITEMS.
FULLY EQUIPPED TO TURN OUT SPECIAL ITEMS.

MAYDWELL & HARTZELL
OUR NAME MAYDWELL SPELLS QUALITY
INCORPORATED
FACTORY DISTRIBUTORS

158-168 Eleventh St.
San Francisco

455 Colyton St.
Los Angeles

Western Progress Number

February 1, 1925

TO present a clear picture of the opportunities presented in the electrical industry in the West for 1925 and give a comprehensive cross-section of the potential market for electrical equipment, appliances and supplies, our editors have selected as the theme for our Feb. 1, Western Progress Number, an analysis of the power company activity for 1924 and an outline of the plans contemplated for 1925.

1. Review of 1924 and Outline of 1925 Proposed Construction Program of the Utilities in the Eleven Western States.
   The article will list the hydroelectric and steam projects completed in 1924, in progress at the present time, or scheduled for 1925. Each project will be briefly discussed, the amount of money involved set down, and the whole article profusely illustrated.
2. Analysis of the Total Connected Load of Western Utilities with Charts of Estimated Growth to 1935.
   Data are being compiled on the total connected load of the Western power companies in the following classifications: Domestic and Commercial Lighting, Agricultural, Railroad, Mining, Industrial and Miscellaneous. Charts will show the growth for the past fifteen years and will be projected into the future. The amount of money to be spent in each of the various classes for electrical equipment will be shown. The installed capacity necessary for serving this load will be noted, as will the kilowatt-hour consumption of energy.

A detailed review of the 1924 construction program will reveal and predetermine the magnitude and extent of the sales activity for 1925. In the West, many large blocks of power have been developed this year or will be ready early in 1925. Sales programs are already outlined for 1925. Merchandising campaigns of large properties are assured.

The analysis of next year's construction program will outline the market possibilities for new apparatus and equipment. With the defeat in the November elections of the so-called Water and Power Act, the power companies of the West are planning very aggressive programs of expansion for 1925.

Supplementing this we will publish the Transmission Line Map of the Eleven Western States, which has been reproduced by the Journal of Electricity every two years. This will be brought up to date and reissued in a size half again as large as in the past. Many important transmission lines have been constructed in the past two years. In addition, the map will show the location of all steam and hydro plants and will give their capacity in kilowatts. Projected generating plants as well as projected transmission lines will also be shown.

The interpretative value of these consolidated statistics will be of interest to every reader. An opportune time for the manufacturer interested in this Western market to present his story will be in combination with this valuable editorial data.

The readers of the Journal are the "Key Men" in the industry. They are the men who either specify the equipment, supervise the construction, control the purchases or sell the output for the Western utilities.

Don't overlook the opportunity of keeping your product before this audience during 1925. The Feb. 1 issue will be worthy of your careful consideration.

Forms close Jan. 25.

Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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Principles of Electroplating and Electroforming

By WILLIAM BLUM, Chemist, U. S. Bureau of Standards and GEORGE B. HOGABOOM, Electroplating Adviser, U. S. Bureau of Standards. 347 pages, 6 x 9, 23 illustrations. Price $4.00.

A practical explanation of those principles of electricity, general and analytic chemistry and electrochemistry essential to the electroplater and the electrotyper. Processes and materials and numerous typical formulas representing the best American practice are clearly and simply presented. The book will prove a valuable working manual for electroplaters and electrotypers, for manufacturers and for electrochemists.

Alternating-Current Armature Winding

By TERRELL CROFT, Consulting Engineer. 352 pages, 5½ x 8, 326 illustrations. Price $3.00.

A practical book on the principles and methods of the winding and rewinding of alternating-current stators.

Conduit Winding

By TERRELL CROFT, Consulting Engineer. 458 pages, 5½ x 8½, 700 illustrations. Net, postpaid, $3.00.

A complete and practical explanation of modern practice in the installation of conduit wiring. The steps and operations which must be followed in installing jobs of all kinds (from small ones in residences to those in the largest office buildings and industrial plants) are discussed and explained in plain, understandable language with accompanying clear illustrations and diagrams.

Wiring for Light and Power

By TERRELL CROFT, Consulting Engineer. Fourth edition, completely revised. 562 pages, pocket size, flexible, 400 illustrations. Price $3.00.

A complete rewriting of this standard wiring handbook to conform to the 1923 edition of the National Electrical Code.

The book is a detailed and fully illustrated commentary on the Code. It explains clearly, in simple language, how to install wiring and apparatus for practically all services. It shows plainly how to meet the requirements of the Code.

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By GORDON FOX, Electrical Engineer; Freyn, Brassert & Company, Consulting Engineers. 492 pages, 5½ x 8, illustrated. Price $3.50.

This book explains the principles, construction and performance of all types of motors and controllers in commercial use—for both direct-current and alternating-current equipment.

Handbook of Telephone Circuit Diagrams With Explanations

By JOHN M. HEATH, 1st Lieutenant, Signal Corps, U. S. Army; Instructor of the Signal Corps Unit, Reserve Officers Training Camp, Massachusetts Institute of Technology. 279 pages, 7 x 4½, 66 diagrams, 8 folding inserts. Price $2.50.

A careful and detailed compilation of the circuits which comprise a telephone system with explanations of how they work. The book brings together in a handy, convenient form the sound principles of manual telephony, both Local Battery and Common Battery, as known today.

The Manufacture of Electric Steel

By FRANK T. CISCO, Chemist and Metallurgist. 304 pages, 6 x 9, 44 illustrations. Price $3.00.

A complete, practical description of the manufacture of electric steel, discussing both acid and basic processes and the chemical reactions involved. The book deals with the practical operation of electric furnaces and the actual making of a heat of steel.

Handbook on Engineering (Steam and Electrical)

By HENRY C. TULLEY. Seventh Edition, fully revised and enlarged by JAMES F. HOBART. 3 volumes, 5½ x 8, 1155 pages, 543 illustrations, library binding. Price $7.50.

A fully revised edition of Tulley's Handbook which for nearly twenty-five years held its place as the leading reference guide of the power plant man in his daily work. The handbook has been brought up to date in its treatment of appliances and methods. A great deal of new material has been introduced and several valuable sections added.

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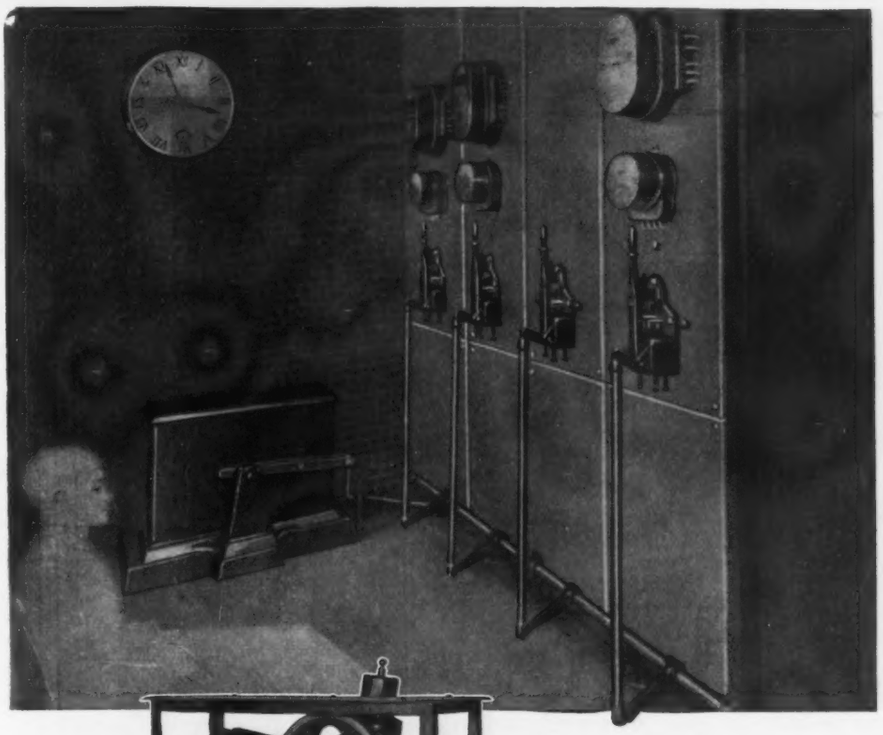

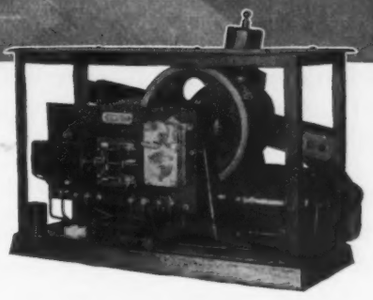

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Always and ever, the Condit Automatic Reclosing Mechanism stands watch on your remote indoor or outdoor sub-stations. Years of service have conclusively proven its reliability. One machine, operated by a fractional h. p. motor, controls a number of feeders.

When a circuit breaker opens from overload or short-circuit, the Condit Automatic Reclosing Mechanism operates instantly—far quicker than the average operator could possibly act—reclosing the circuit or circuits. Once, twice or three times—if the short or overload persists—this more than human device recloses the breaker or breakers that have opened.

The Condit Automatic Reclosing Mechanism—working as it does from a fractional H. P. motor on A. C. circuits—affords tremendous possibilities for reductions in operating expense, insures never failing attendance to the feeders, and reduces service interruptions to the minimum. Send for Bulletin No. 456.

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The trade-mark "Anaconda" appears on the complete line of copper wire manufactured by the American Brass Company and on the bare copper wire and strand made by the Anaconda Copper Mining Company. The products include—bare copper wire and strand, weather-proof wire, lead covered cable, office and annunciator wire and trolley wire.

Embodying the skill and production processes accumulated through years of experience and backed by the largest manufacturing facilities in the copper and brass industry, the products are standard in their field.

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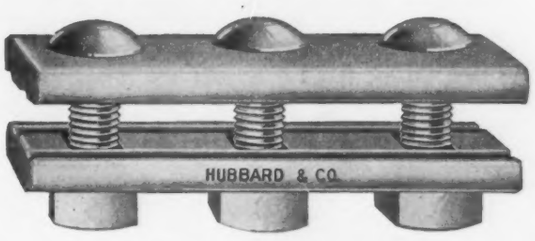

What Makes a Guy Clamp Hold?

From numerous tests made on every type of guy clamp on the market it has been definitely concluded that the holding power of a clamp depends on the area of the clamping surface actually in contact with the strand — and, the strength of the bolts used.

It has, also, been found that a straight smooth groove provides greater area in contact with the strand and develops greater holding power than a wire groove with projections, notches, scores or otherwise deformed for the purpose of offering resistance to the strand. And with the smooth groove there is not the slightest possibility of injury to the strand.

The No. 7461 clamp is made with heavy rolled steel sides 6 inches long, provided with straight smooth wire grooves. The bolts used are 5/8-inch in diameter made from a special high strength steel and are guaranteed to develop a tensile strength of 18,000 pounds. These heavy high strength bolts eliminate the danger of twisting off or straining the bolts when the nuts are tightened.

Each side of the clamp has square holes punched in it so that any of the bolts may be reversed at will.

When tested under actual working conditions with Siemens-Martin guy strand this clamp will develop an average load of 11,000 pounds without slipping.

This clamp has recently been adopted as the standard of the N. E. L. A. and the A. T. & T. Company.

Furnished, also, in a 2-bolt, 4-inch size, the stock number of which is 7462.

HUBBARD & COMPANY

Pittsburgh, Pa.

"Check" Seal

PACIFIC STATES ELECTRIC COMPANY

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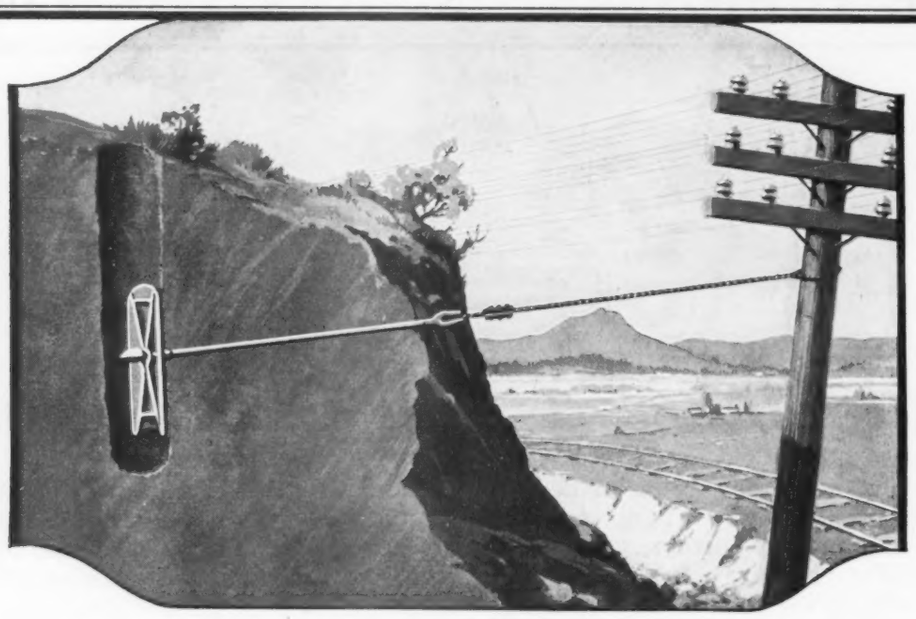
"Check" Seal

"Bolted Through Solid Earth"



Why Not Stick in a Never Creep?

It's an easy matter to stick in a Never Creep anchor and then forget it for all time.

There are no pits to be dug. Simply drill a hole for the anchor plate with an auger, drive the anchor rod through the solid earth at right angles to the auger hole and hook on the anchor plate. The pole is anchored safely and indefinitely to solid, *undisturbed* earth.

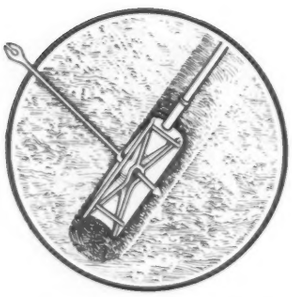
Chance Never Creep anchors, unlike wooden "deadmen", never skid, slip, or rot away.

They are made in different sizes to meet various strain requirements.

Manufactured by

CHANCE COMPANY

CENTRALIA, MO.



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Exclusive Pacific Coast Sales Agents

Quality Electrical Merchandise
THE MARK THAT MEANS INSPECTED & CERTIFIED by PACIFIC STATES ELECTRIC COMPANY
Chosen from the Markets of the World

The development of Locke Porcelain

THE manufacture of porcelain is one of the oldest arts. From the ages its character has continuously developed as new uses required. Twenty-five years ago it was first used by Locke as an insulation for electricity.

Since that time a demand for more and better porcelain was created by the rapid and continuous development in the use of electricity. Locke, the pioneer, gradually and concurrently solved the problem.

Equipment was designed and built to produce quantity and constant quality. Scientific research discovered new and better raw materials. Exact ceramic knowledge was added to the skill of long experience.

Today Locke Porcelain, thirty years in development, is insulating the most modern electric transmission lines in this country and in those countries which were making porcelain before America was discovered. Locke Porcelain will continue in the future to develop in step with the technical demand.

High tension insulators require the use of the most modern porcelain. Locke Insulators are exclusively made of Locke Porcelain.

LOCKE INSULATOR CORPORATION
Baltimore, Md., and Victor, N. Y.

PACIFIC STATES
ELECTRIC COMPANY
San Francisco Los Angeles Oakland
Portland Seattle Spokane
Exclusive Pacific Coast Sales Agents

LOCKE
PORCELAIN

BAKELITE

Corporation

Factory:
Middletown, Ohio

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BAKELITE—Varnishes
BAKELITE—Cement
BAKELITE—Lacquer and Enamels
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Monarch Renewable Fuses
Approved in all Capacities
by
N. E. C. Standards
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U. S. Navy Specifications
Made to Stand the Most Severe Uses,

MONARCH

REFILLABLE FUSE CO.
Factory: Jamestown, N. Y.

No. 6276
Toggle Switch
with No. 7121
Bakelite Plate

No. A-1
Attachment
Plug

No. 990
Duplex
Unit
Receptacle

Where Good Taste Predominates

HOW often the question has been presented, as to some means of eliminating the brass plates, used in connection with electric switches, receptacles, etc. These plates soon become discolored, and make a distasteful appearance, and reflect an impression of cheapness on the rest of the surroundings.

Architects, builders and contractors have been up against this problem, because they're not in keeping with the modern decorations of the average home.

Conveniently located outlets, as shown in this illustration, are very essential in lighting effects. What a striking contrast between the cheap wavy brass plates, with their shining and glaring effect, as compared with the soft, delicately colored fittings of Connecticut quality, pictured above.

Connecticut devices are ornaments in the most conspicuous places, because of the beautiful rich brown egg-shell finished plates, made of genuine "Bakelite," which never tarnishes or requires re-finishing. Besides, there are no metal parts exposed, which eliminates the possibility of shock in the course of operation, from defective wiring, grounds, etc. "ANOTHER CONNECTICUT IMPROVEMENT."

THE CONNECTICUT ELECTRIC MFG. CO.
MAIN OFFICE AND FACTORY: BRIDGEPORT, CONN.
New York Chicago San Francisco

CONNECTICUT "A-1" DEVICES

A CERTAIN beauty of form and exquisite blend of coloring cause one instinctively to associate a Handel Lamp with the fine paintings and beautitul rugs of a perfectly appointed home. And a Handel Lamp is just as lasting also; it also is designed to be permanent—different from the fragile lamp that so soon fades and is so easily broken.

Handel Lamps are now using Connecticut plugs made of genuine Bakelite.

The lamp shown is No. 6868.

This attractive plug made of genuine Bakelite is now being furnished with all Handel Lamps.

HANDEL *Lamps*

THE HANDEL COMPANY, MERIDEN, CONNECTICUT

PELTON

Largest Reaction Turbine Runner Yet Built in the West

Utilizes
1100 cu. ft. sc.
under 72 ft. hd.

Weight
Approx. 6 1-2 tons

Diameter 8 ft.

This runner was built in the San Francisco works of The Pelton Water Wheel Co. as part of a Pelton turbine supplied to the U. S. Government for the development of power at the Panama Canal. It is a single bronze casting, machined and hand finished to templet.

The Pelton works are equipped with machine tools especially designed to handle large pieces and obtain extreme accuracy, so essential to high turbine efficiency and continuous, economical operation.

These facilities, together with a background of engineering service dating back more than thirty-five years, are constantly available to the power industry in the solution of its problems.

THE PELTON WATER WHEEL COMPANY

Hydraulic Engineers

2985 Nineteenth St., San Francisco — **100 Broadway, New York, N. Y.**

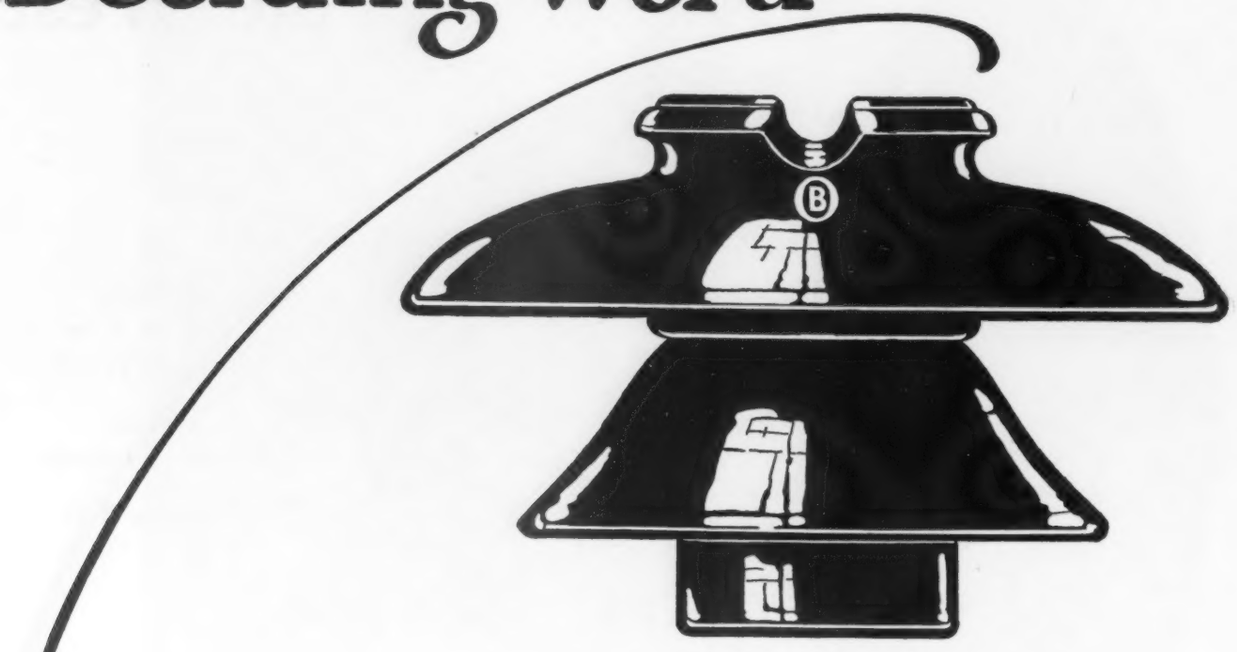
Associated Companies: Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia; Dominion Engineering Works, Montreal; M. Hilpert & Co., Rio de Janeiro.

Pacific Coast Sales Representatives: Cramp Composition Metals; White Brass Ingots, Manganese Bronze Ingots, High-Pressure Bearing Bronze, Welding Metals.

PELTON

ENDURANCE

The Last and Deciding Word



The whole matter of insulator economy can be summed up in one word "Endurance".

And, since endurance is something that cannot be measured in advance, the buyer must depend upon service records to indicate what he may expect.

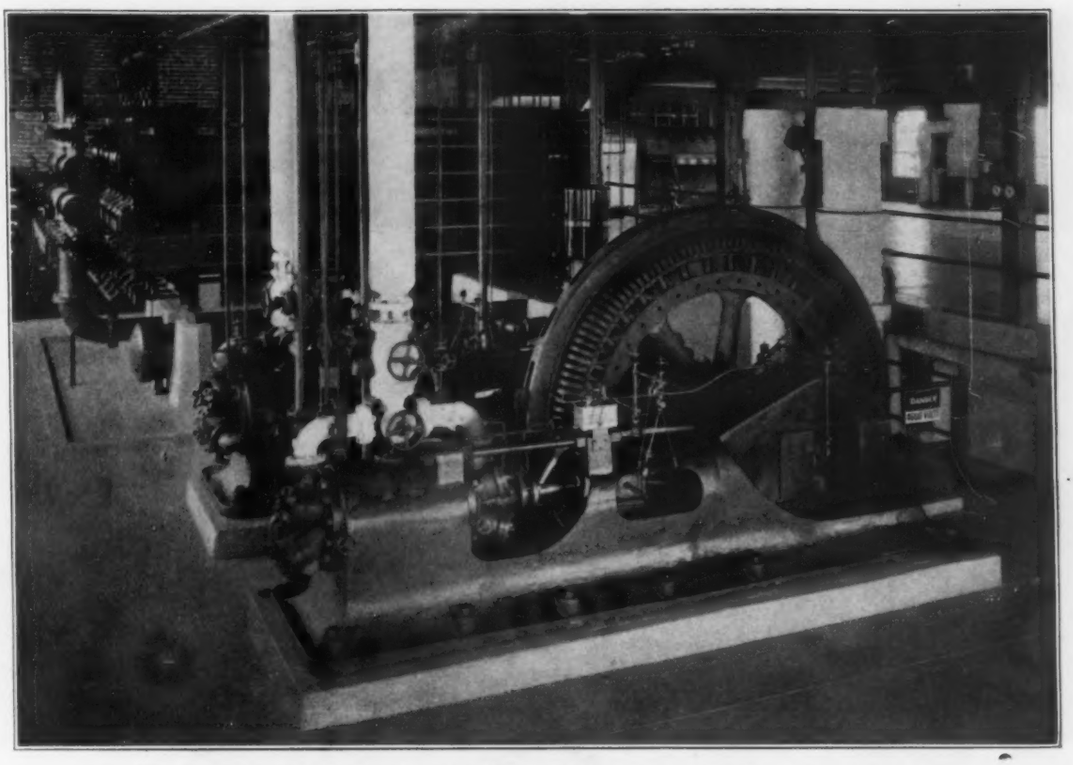
O-B Insulators have an enviable service record which proves the correctness of the principles under which they are made.

We suggest that you study that record.

The Ohio Brass Company
Mansfield, Ohio, U. S. A.

B INSULATORS

TIME IS THE TEST



250 H.P., 100 R.P.M., Synchronous Motor Driving Duplex, Double Acting Ammonia Compressor. Pittmans & Dean Co., Detroit, Mich., Geo. B. Bright Co., Engineers

Synchronous Motors for Artificial Ice Plants

Allis - Chalmers Synchronous Motors are designed with a thorough knowledge of the fly-wheel effect required, thus making compact units; fly-wheels usually being omitted.

Ease in starting, successful running and high efficiency are assured in all motors.

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Steam Turbines
Steam Engines
Gas and Oil Engines
Hydraulic Turbines
Crushing and Cement Machinery
Mining Machinery

ALLIS-CHALMERS MANUFACTURING COMPANY
MILWAUKEE, WISCONSIN, U.S.A.
District Offices in All Leading Cities.

ALLIS-CHALMERS PRODUCTS
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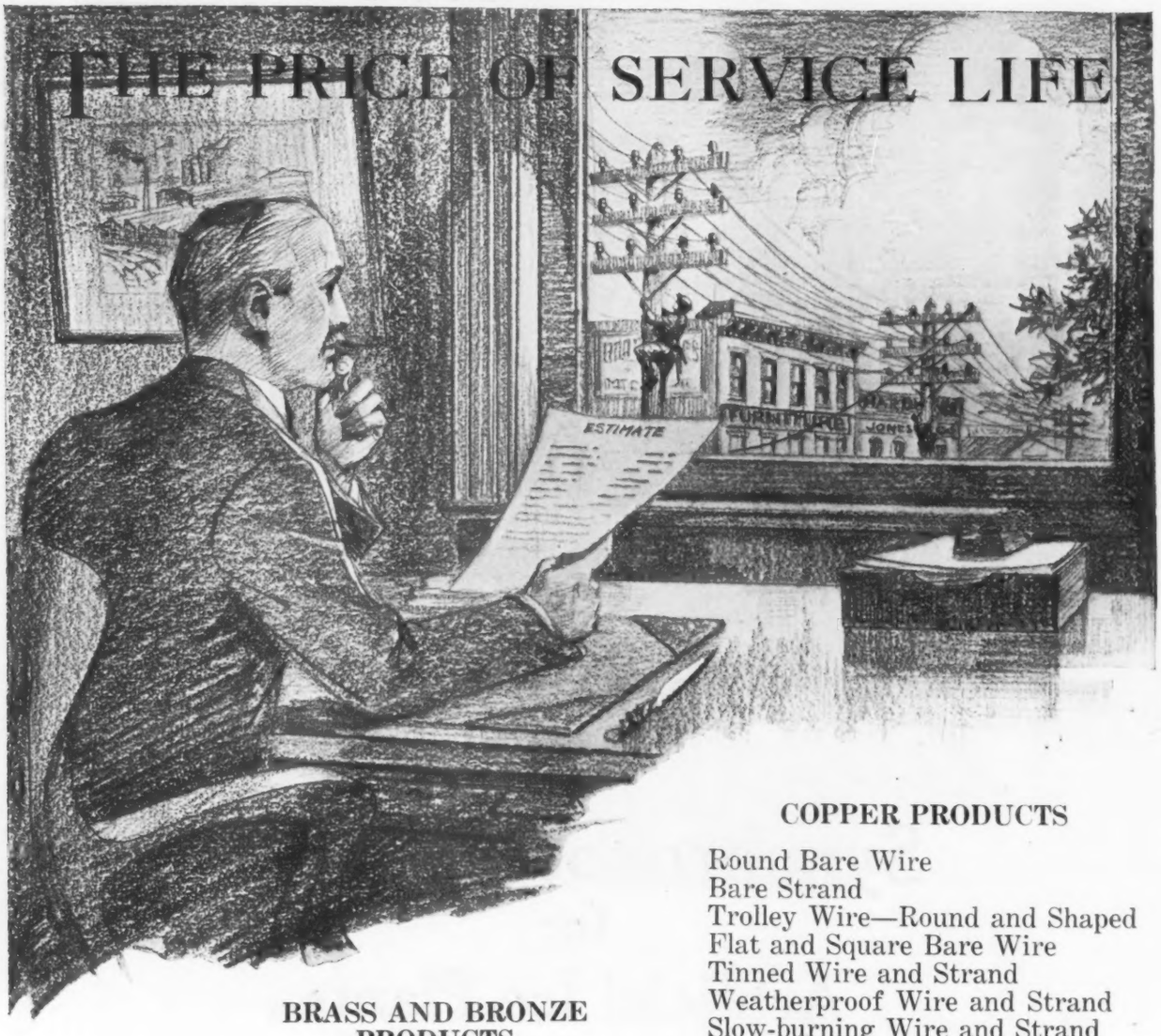
Power Transmission Machinery
Pumping Engines-Centrifugal Pumps
Steam and Electric Hoists
Air Compressors - Air Brakes
Agricultural Machinery
Condensers



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Brass and Bronze Flat and Square Wire

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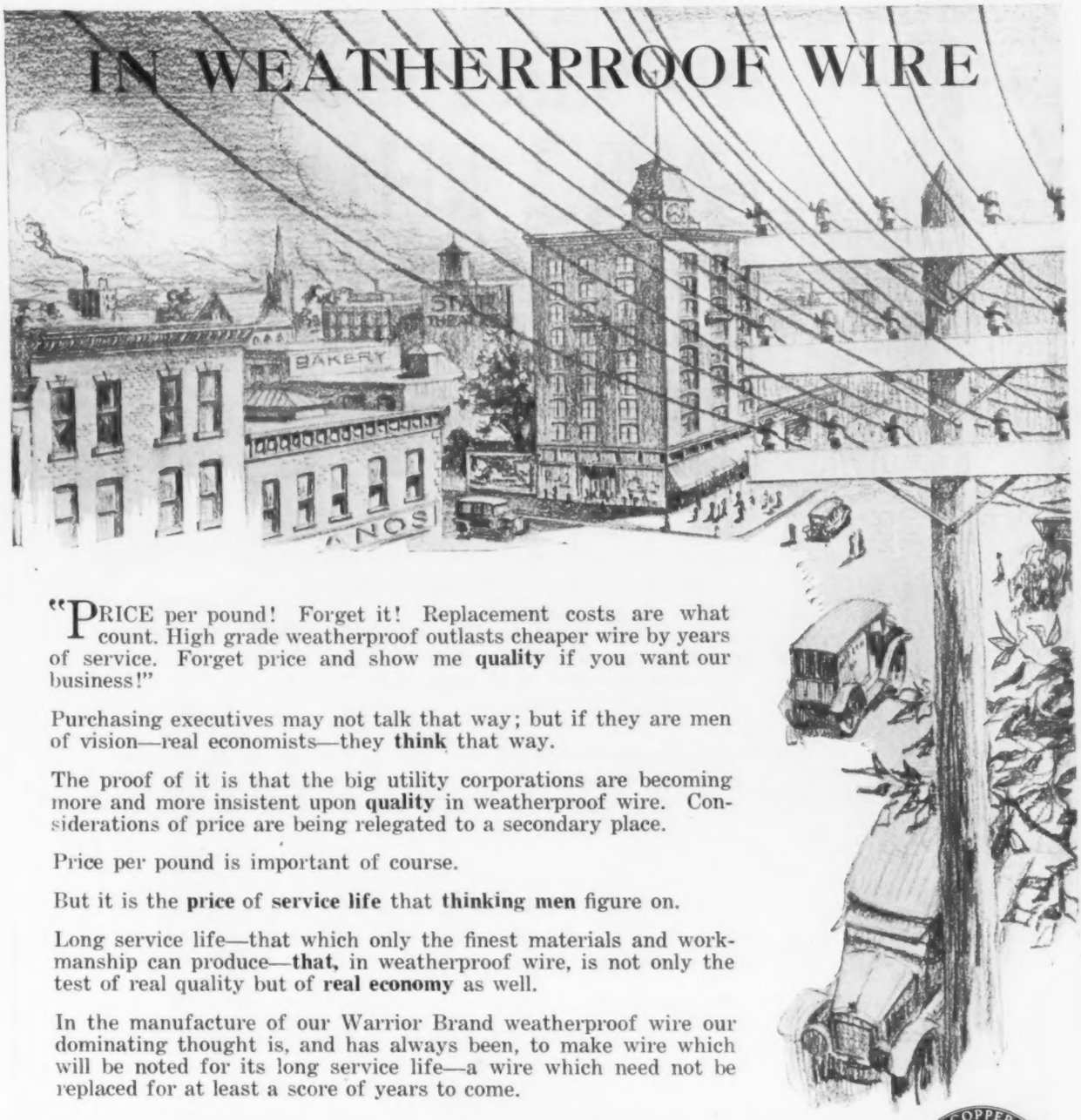
Tinned Wire and Strand
Weatherproof Wire and Strand
Slow-burning Wire and Strand
Bus Bars
Copper in Rolls
Rolled Rods
Drawn Rods—Round, Square and Rectangular

AMERICAN COPPER PRODUCTS CORPORATION

WARRIOR-BRAND
Weatherproof Wire
Mills, Bayway, N. J.

AMERICAN COPPER PRODUCTS CORPORATION
233 BROADWAY NEW YORK

IN WEATHERPROOF WIRE



"PRICE per pound! Forget it! Replacement costs are what count. High grade weatherproof outlasts cheaper wire by years of service. Forget price and show me **quality** if you want our business!"

Purchasing executives may not talk that way; but if they are men of vision—real economists—they **think** that way.

The proof of it is that the big utility corporations are becoming more and more insistent upon **quality** in weatherproof wire. Considerations of price are being relegated to a secondary place.

Price per pound is important of course.

But it is the **price** of **service life** that **thinking men** figure on.

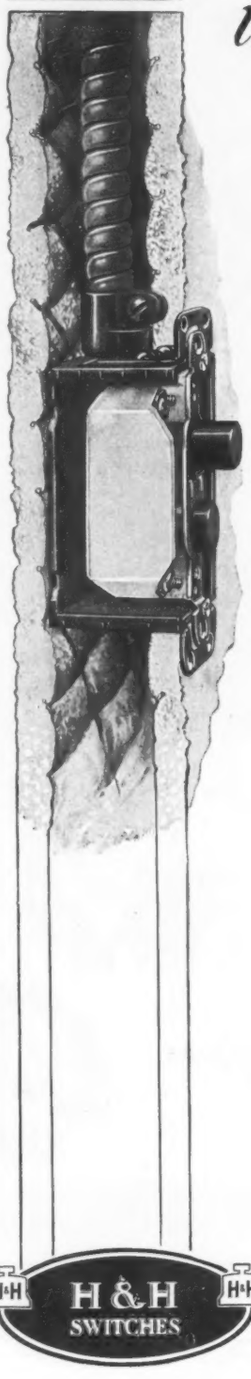
Long service life—that which only the finest materials and workmanship can produce—**that,** in weatherproof wire, is not only the test of real quality but of **real economy** as well.

In the manufacture of our Warrior Brand weatherproof wire our dominating thought is, and has always been, to make wire which will be noted for its long service life—a wire which need not be replaced for at least a score of years to come.

WARRIOR-BRAND
Weatherproof Wire
Mills, Bayway, N. J.

AMERICAN COPPER PRODUCTS CORPORATION
233 BROADWAY NEW YORK

NUTMEG RELIABILITY *in a* SHALLOW *Switch*



You've seen "NUTMEG" support the contractor's work —everywhere. In the shallow partition it's the same old "NUTMEG", backing you up.

You know it as the "competitive-price" switch of Hart & Hegeman. It is all of that—as low-priced as the lowest. It is *more* than that, for "NUTMEG'S" price never explained its sturdiness.

It has stood at the head of its price-class, *because* it has stood out from that class mechanically. With the higher-priced switches of H & H, "NUTMEG" shares certain advantages.

We couldn't alter the fine-points of H & H design, or change the accuracy of H & H dies, or lose the precision of H & H workmen — just while we're making "NUTMEG!"

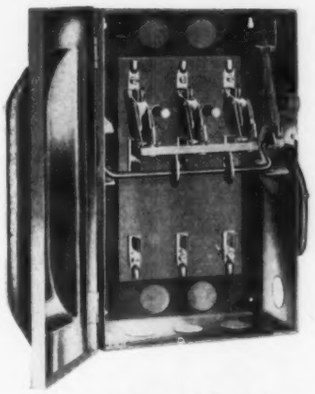
The quality is *in* it, for the quality couldn't be kept out of it, and the result is seen in more installations than of any other flush switch in use. It has helped the contractor bid down to a price without cutting down the permanence of his work. It's even cheaper—because *quicker*—to install in the 1-inch depth.

Shallow NUTMEG has the same catalogue number as the standard-base type: 4401, with an "S" added to signify *shallow*. Either send for special circular, or the H & H Catalogue if you haven't one handy.

H & H SWITCHES

THE HART & HEGEMAN MFG. CO.
HARTFORD, CONN.

Insure Your Plant with Switches That Are More Than Legally Safe



Type "A" 600 Volt A.C. Quick Make & Break With Snuf-Arcs

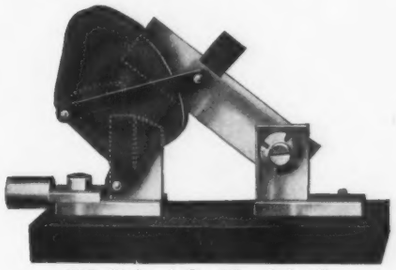
Install "Circle T" Class "A" Switches with

1. **ABSOLUTE QUICK-MAKE AND QUICK-BREAK that insures perfect closing and opening action of the Switch. It is either fully opened or fully closed at all times.**
2. **SNUF-ARCS that allow opening of switch under load with full safety. The switch blade is enclosed in a moving, moulded barrier absolutely preventing sideflare or spreading of the arc to adjoining metal parts.**
3. **PERMISSIVE INTERLOCK which permits of inspection and tests by authorized persons only, at the same time preventing unauthorized persons from coming in contact with live parts.**

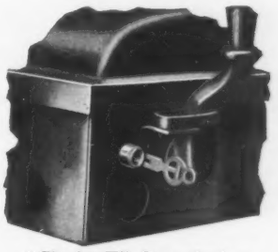
The Type A Quick Make and Quick Break Spring

Rugged dependability is built into every part of a "Circle T" Safety Switch. They are of swetted and pinned construction built to withstand overloads and abuse. All parts are of hard drawn copper machined to exact size and subjected to rigid inspection on assembly. These facts together with the distinctive safety features insure uninterrupted service from electricity for any industrial application. Insist on "Circle T" installation in your plant.

The Ideal Switch for 440 Volt A. C. Service



600 Volt A.C. "Snuf-Arc"



"Circle T" Permissive Interlock Attachment

The Trumbull Electric Mfg. Company

595 Mission St., San Francisco, Cal.

Factory and General Offices
PLAINVILLE, CONNECTICUT

Branches in New York, Chicago, Boston, Philadelphia, Atlanta

CEDAR POLES

Complete Stocks of Seasoned Poles Available for Immediate Shipment

— All Standard Treatments —

Adequate stocks and strategic locations of our yards and treating plants enable us to give exceptional service to the discriminating buyer, furnishing seasoned and carefully inspected poles at reasonable prices.

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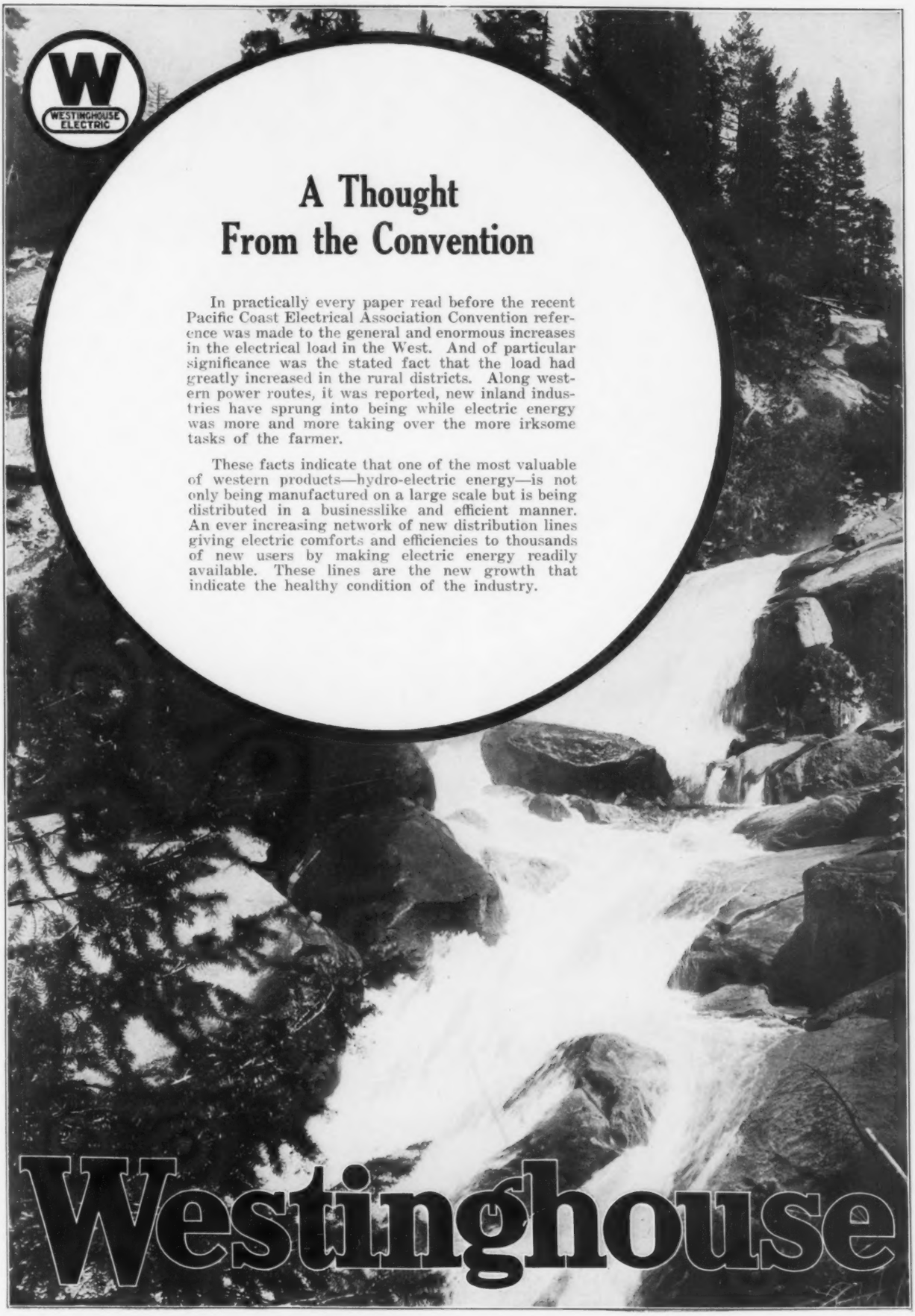
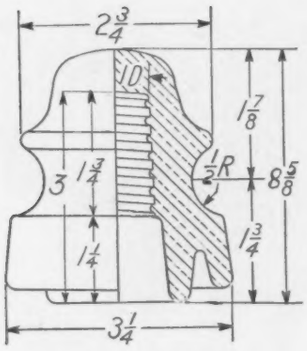
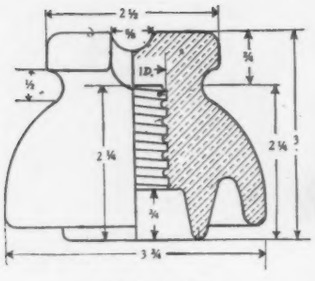
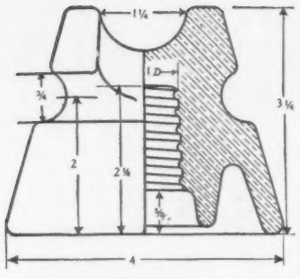

W
WESTINGHOUSE ELECTRIC
A Thought From the Convention
In practically every paper read before the recent Pacific Coast Electrical Association Convention reference was made to the general and enormous increases in the electrical load in the West. And of particular significance was the stated fact that the load had greatly increased in the rural districts. Along western power routes, it was reported, new inland industries have sprung into being while electric energy was more and more taking over the more irksome tasks of the farmer.
These facts indicate that one of the most valuable of western products—hydro-electric energy—is not only being manufactured on a large scale but is being distributed in a businesslike and efficient manner. An ever increasing network of new distribution lines giving electric comforts and efficiencies to thousands of new users by making electric energy readily available. These lines are the new growth that indicate the healthy condition of the industry.
Westinghouse



No. 104



No. 146

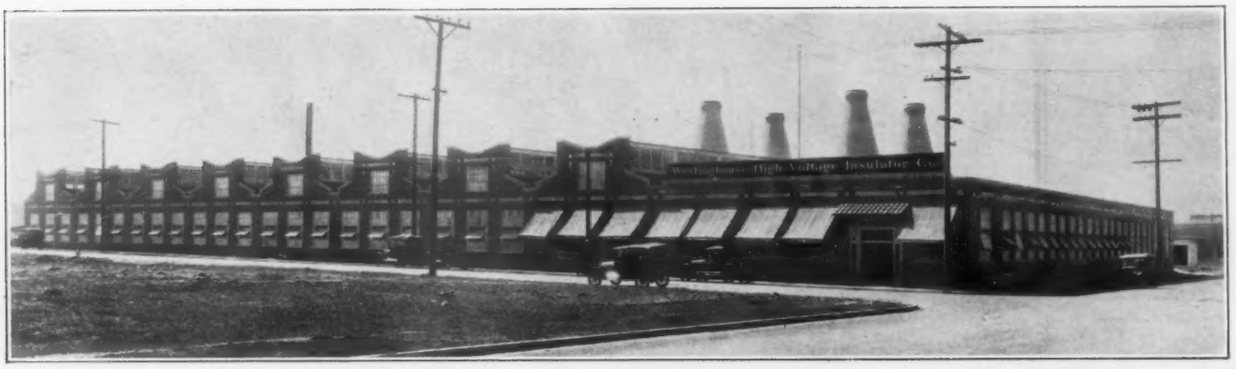


No. 136

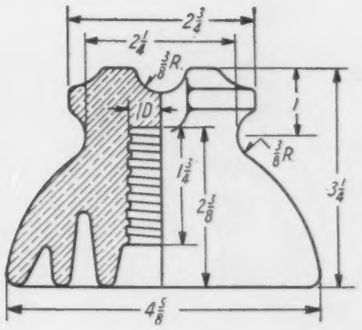
Porcelain Pin-

For Distribution Systems where Continuity of Service is Necessary

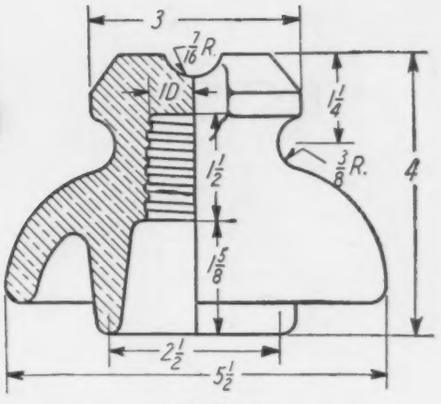
The illustrations shown are cross-sections of a few of our complete line of porcelain low-tension, pin-type insulators. They are made by the same process, with the same porcelain body, and with the same care as our high-tension insulators. In every detail they represent the most rugged types for distribution service. There is a design for each line voltage to suit every local condition.



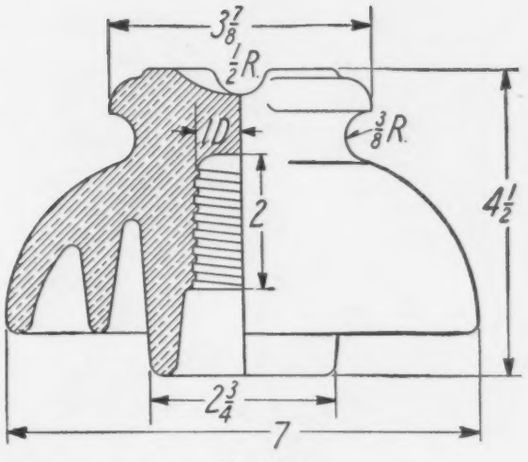
Type Insulators



No. 1311



No. 1012



No. 1014

At the Pacific Coast plant of the Westinghouse High-Voltage Insulator Company, large stocks of these pin-type insulators are carried at all times. Orders for these insulators can be filled immediately upon their receipt. In addition, the location of this plant, the only insulator manufacturing works in the West, affords shipments by the quickest and shortest routes to all parts in the West. A western order for pin-type insulators is always an order on this plant.

Large stocks carried in: Denver, Salt Lake City, Seattle, San Francisco, Los Angeles.

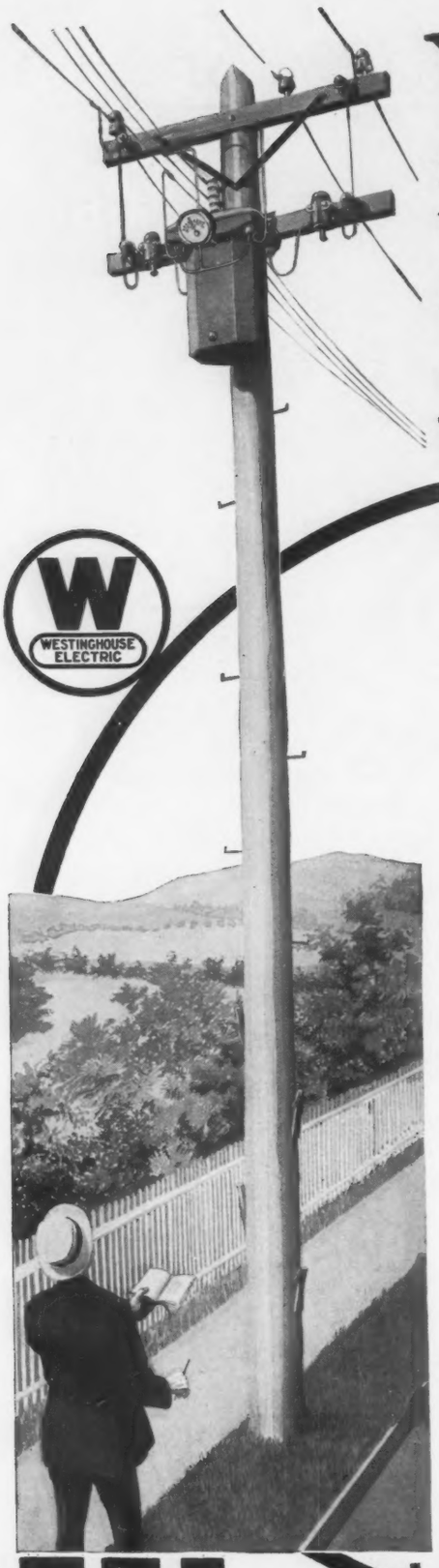
Westinghouse Electric & Manufacturing Co.
Agent for Westinghouse High-Voltage Insulator Co.
Western Branch Works, Emeryville, Cal.

Westinghouse

You Lose Money

from both overloaded and underloaded transformers

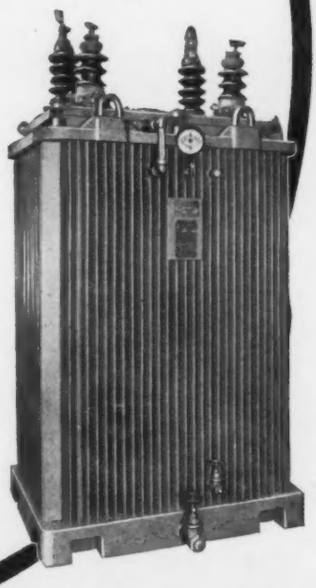
Avoid these losses by equipping each transformer with a Westinghouse Transformer Thermal Indicator



which tells at a glance the operating conditions of each power or distribution transformer. A black pointer gives a continuous indication of the oil temperature, while a red pointer records the maximum temperature reached.

The red pointer is easily reset.

Send for leaflet 20018 and read all about the Westinghouse Transformer Thermal Indicator



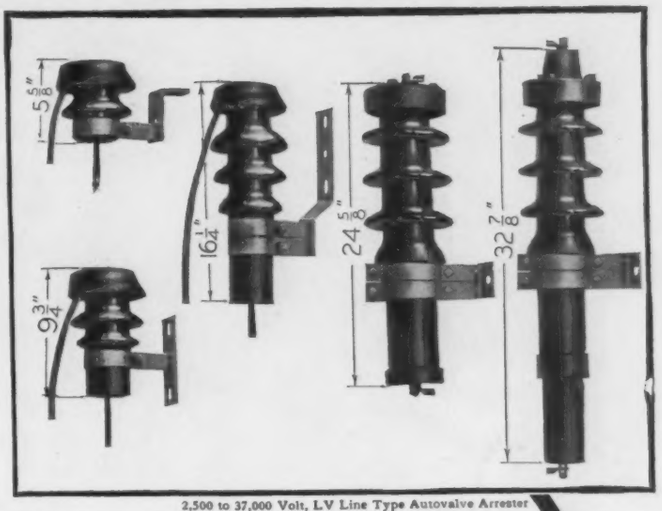
Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

A Complete Line Of Valve Type Arresters

25,000 Volt, 3-Phase, Outdoor SV Autovalve Station Arrester



2,500 to 37,000 Volt, LV Line Type Autovalve Arrester

The **Autovalve** is the first arrester operating on the "Valve Principle" to cover the entire alternating-current field. The SV is a station arrester for the protection of generating stations and substations.

The LV is the youngster of the **Autovalve** family, intended for the protection of distributing transformers. It is the only distribution arrester on the market operating on the recognized superior "valve principle."

The **Autovalve** is a dry-type arrester requiring no charging.

The small-space factor and mechanical advantages for mounting are secondary but, nevertheless, important features in the popularity of this line of arresters.

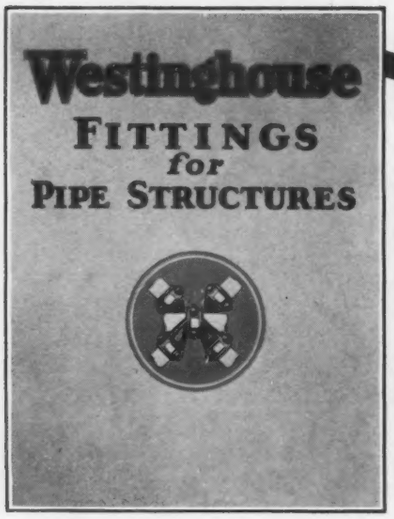
Leaflet 20012-A describes the Line Arresters.

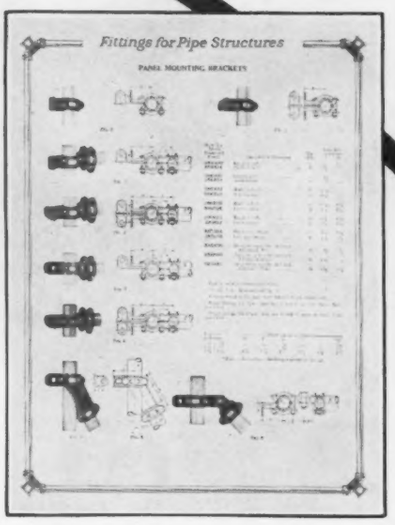
Leaflet 20149 describes the Station Arresters.

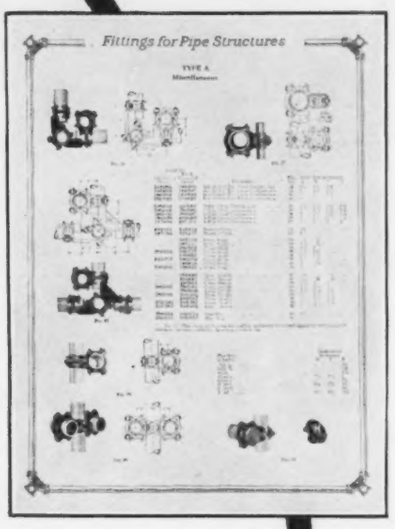
Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pennsylvania
Sales Offices in All Principal Cities of the United States and Foreign Countries

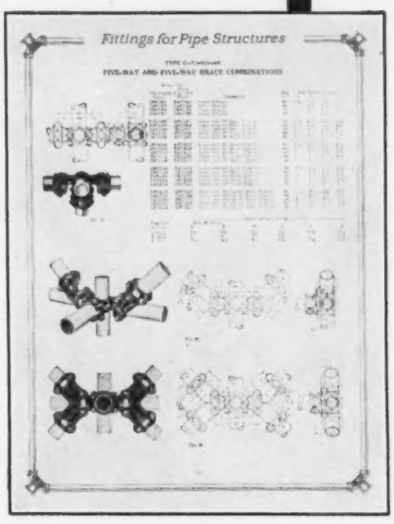
WESTINGHOUSE ELECTRIC

Westinghouse









Westinghouse Yoke-Bolt Pipe Fittings

Circular 1676, describing in detail Westinghouse structural pipe fittings, is now ready for distribution. A brief synopsis of this publication brings out the following good points of the new Westinghouse fittings.

STRENGTH——Made of the best malleable iron procurable, having a tensile strength of 50,000 pounds per square inch.

ECONOMY——Greater saving of time and labor in assembly. Skilled labor is not required to install Westinghouse fittings.

FLEXIBILITY—Many combinations can be made with a few unit parts. This means a relatively small and flexible stock.

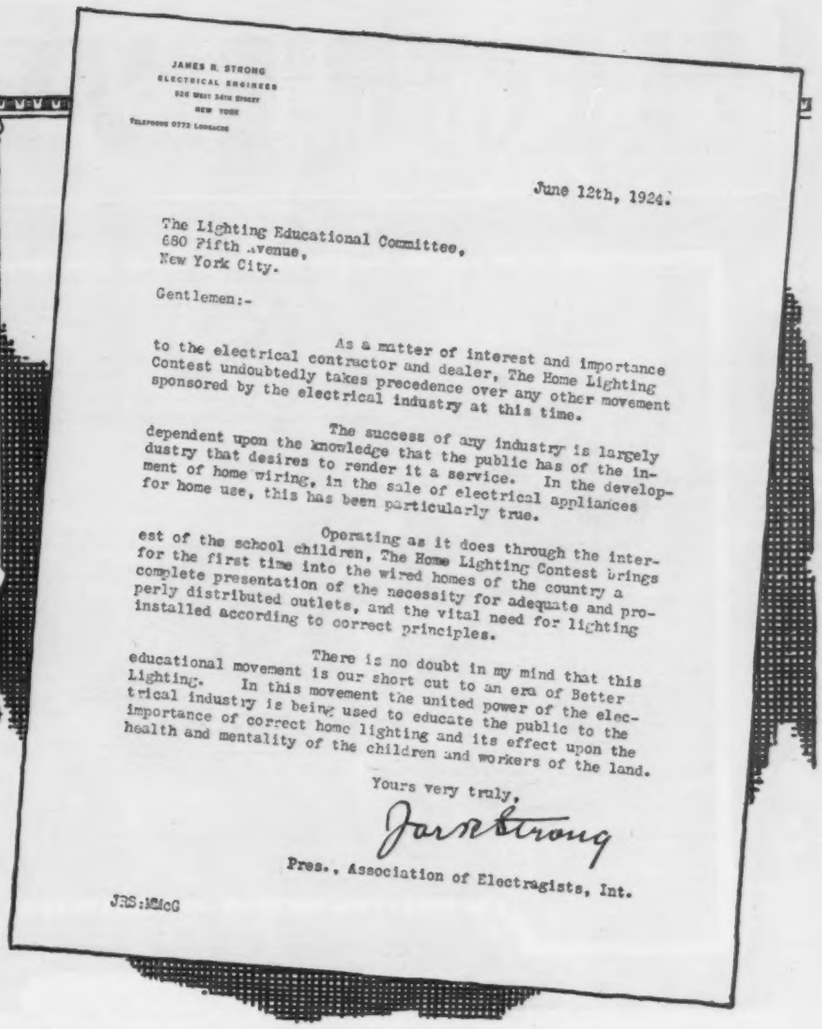
These novel and outstanding characteristics of the new Westinghouse structural pipe fittings are fully described and illustrated in detail. Write for a copy of Circular 1676 and get the complete story.

Westinghouse Electric & Manufacturing Co.
East Pittsburgh, Pa.

Butte, 52 East Broadway
Denver, 910 Fifteenth St.
El Paso, Mills Building
Fresno, Griffith-McKenzie Bldg.
Los Angeles, 420 S. San Pedro St.
Portland, Porter Bldg.
Salt Lake City, 2nd South and Main Sts.
San Francisco, 1 Montgomery St.
Seattle, 3451 E. Marginal Way.
Spokane, 821 Old National Bank Bldg.
Tacoma, 615 Rust Bldg.
Tucson, 90 Church St.

Westinghouse

HAS YOUR TOWN STARTED A Home Lighting Contest?



JAMES R. STRONG
ELECTRICAL ENGINEER
526 WEST 34TH STREET
NEW YORK
TELEPHONE 0772 LONGACRE

June 12th, 1924.

The Lighting Educational Committee,
680 Fifth Avenue,
New York City.

Gentlemen:-

As a matter of interest and importance to the electrical contractor and dealer, The Home Lighting Contest undoubtedly takes precedence over any other movement sponsored by the electrical industry at this time.

The success of any industry is largely dependent upon the knowledge that the public has of the industry that desires to render it a service. In the development of home wiring, in the sale of electrical appliances for home use, this has been particularly true.

Operating as it does through the interest of the school children, The Home Lighting Contest brings for the first time into the wired homes of the country a complete presentation of the necessity for adequate and properly distributed outlets, and the vital need for lighting installed according to correct principles.

There is no doubt in my mind that this educational movement is our short cut to an era of Better Lighting. In this movement the united power of the electrical industry is being used to educate the public to the importance of correct home lighting and its effect upon the health and mentality of the children and workers of the land.

Yours very truly,

Jas R Strong

Pres., Association of Electragists, Int.

JRS:MMcG

The Home Lighting Contest is the great educational movement approved and endorsed by the whole electrical industry. It is designed to bring into each wired home a complete knowledge of the benefits to be obtained from good home lighting.

The main feature of The Home Lighting Contest is the essay competition among 24,000,000 school children of the country. Local and national prizes will be awarded to the winning children. The First National Prize is the $15,000 model electrical home of 1924.

To get the full benefit of this activity, start now to organize your local contest. Arrange to have this model electrical home built for display in your town.

Start the activity in your town now — write for your Plan Book. No city is too large—no town too small to join in this great activity.

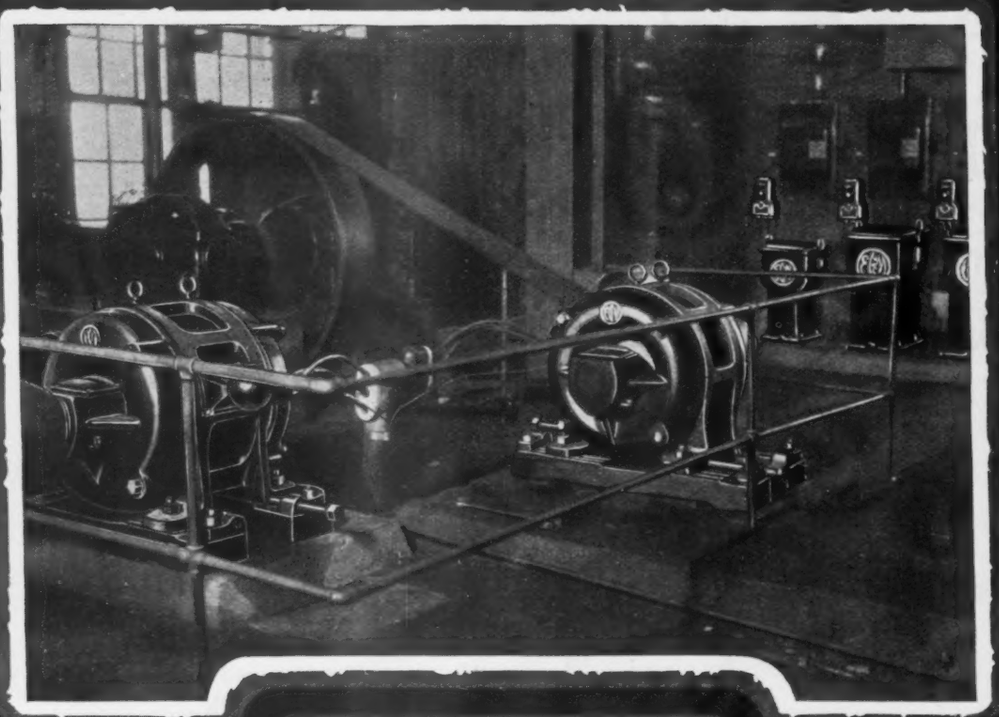
There is an experienced Regional Director near you who will help you organize and plan successfully.

HOME LIGHTING CONTEST

The LIGHTING EDUCATIONAL COMMITTEE

680 Fifth Avenue • • • New York, N.Y.

ELECTRIC VS. GAS



One of the Type NC Motors shown drives a DC Generator, the other an Air Compressor.

Both were installed to replace gas engines.

The cost of power delivered to belt is less with the Motors than with the gas engines.

Both Motors are controlled by EC&M. Automatic Compensators.

for Motors — Bulletin 1045-A
for Compensators — Bulletin 1042-D

THE ELECTRIC CONTROLLER & MFG. CO.
CLEVELAND, OHIO

FOR SOUTHERN CALIFORNIA:
O. E. THOMAS,
AMERICAN BANK BLDG., LOS ANGELES

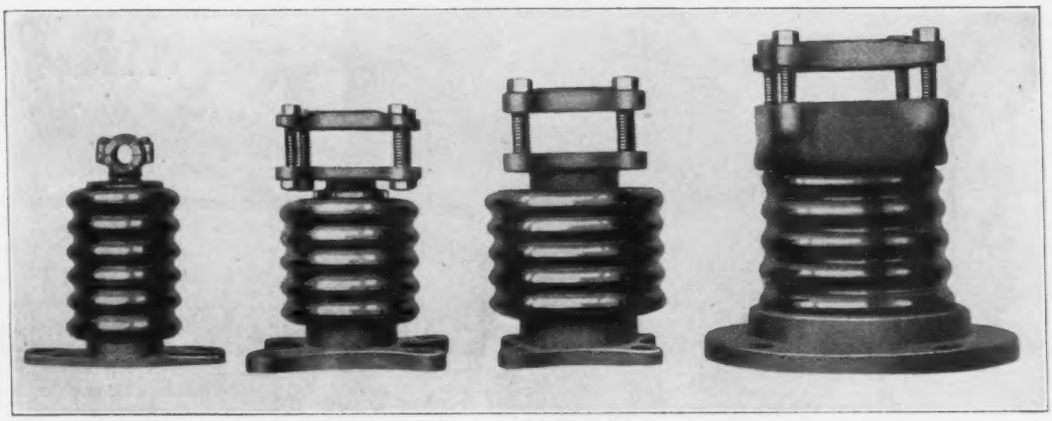
FOR STATES OF OREGON AND WASHINGTON:
W. MONTELIUS PRICE, SEATTLE, WASH.

FOR NORTHERN CALIFORNIA:
C. F. HENDERSON,
CALL BLDG., SAN FRANCISCO

HIGH TENSION EQUIPMENT

UNIT TYPE UNIT TYPE UNIT TYPE UNIT TYPE UNIT TYPE UNIT TYPE

Bus Supports For Every Service



Diameter 3¾ inches | Diameter 4¾ inches | Diameter 6 inches | Diameter 6½ inches

Advertising Made Him Forget

A few days ago a well known public utility engineer was at our factory inspecting some 132,000 volt equipment being built for his company. He seemed surprised at our large volume of bus support business—in fact, had the impression that we did not particularly care for this class of business.

This was somewhat of a shock to us, so we asked him point blank where he got such an idea. It developed he is a close reader of Electrical World advertising and the large amount of space we devote to outdoor equipment had created this impression.

As a gentle reminder to others who may, also, have forgotten, we illustrate above just a few of our indoor bus supports for standard heavy and extra heavy duty.

We have thousands of indoor supports, switches, and other combinations—so if you, also, have been too much influenced by our outdoor equipment advertising—give us an opportunity to quote on your requirements—we can give you Unit Type throughout. Our opportunity will be yours.

We know our Bulletins will interest you. Why not send for them—today?

DELTA-STAR ELECTRIC CO., 2433-61 Fulton Street, Chicago, Illinois

Manufacturers of High-Tension Equipment

LOS ANGELES	SALT LAKE CITY	SAN FRANCISCO	SEATTLE
W. W. Kirk	L. Brandenburger	W. W. Kirk, Representative	W. R. Hendrey
212 I. W. Hellman Bldg.	419 Dooly Bldg.	F. J. Gleiss, Manager	Hoge Bldg.
		193 Second Street	

DELTA-STAR

The Standard of Comparison

UNIT TYPE INTERCHANGEABLE PARTS

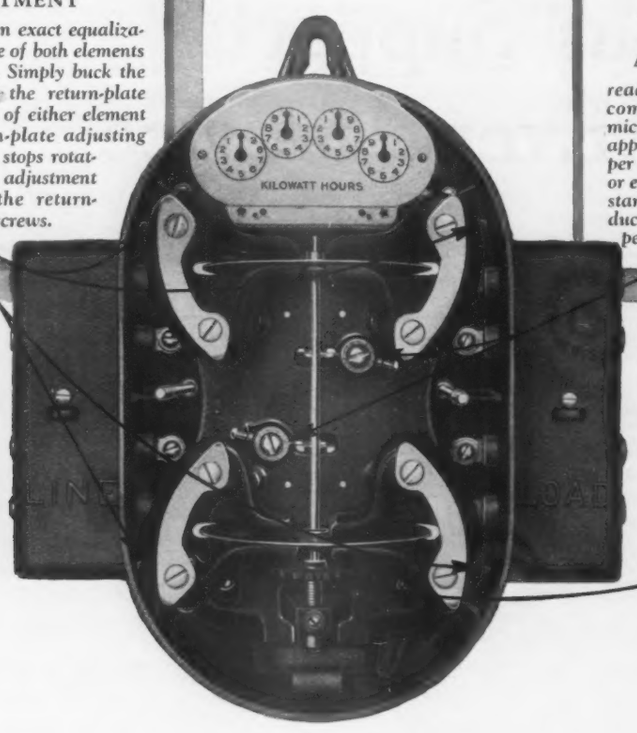
Great ease of Adjustment

Torque-balancing
ADJUSTMENT

makes possible an exact equalization of the torque of both elements on a given load. Simply buck the elements, loosen the return-plate clamping screws of either element and turn return-plate adjusting levers until disk stops rotating. Then lock adjustment by tightening the return-plate clamping screws.

Light-load
ADJUSTMENTS

readily accessible. One complete revolution of micrometer screw produces approximate change of 2.5 per cent at one-tenth load, or each of the ten divisions stamped on the screw produces a change of ¼ of one per cent.



Full-load
ADJUSTMENT

Simply loosen clamp screw and turn iron disk. When adjustment is made clamp screw locks it in position. All accomplished without moving the magnets.

HIGH SUSTAINED ACCURACY

Even on Unbalanced and Highly Inductive Polyphase Loads

HIGH sustained accuracy even on unbalanced and highly inductive loads is one of the outstanding features of the Sangamo Vertical Polyphase Meter. This advantage, combined with simplicity and ease of adjustment is largely responsible for the enviable reputation which this meter enjoys.

Two single-phase elements are mounted one above the other, each element having its own disc connected to a common shaft which records the sum of the two torques on a single dial. An iron barrier is placed between the two elements so that they have practically no inductive or magnetic effect upon each other. As a result no matter how badly unbalanced or how highly inductive the load on a polyphase system may be, the registration of both elements is correct within very small limits.

All adjustments can be made with ease and accuracy. After the meter is once adjusted the entire moving element may be removed without disturbing any of the adjustments.

The register, series magnet, series coils, shunt magnets and all other parts can be readily removed and interchanged.

Bulletin No. 67 describes this meter in detail and tells about the refinements in design and construction that mean so much in the accurate metering of alternating-current energy. A copy is yours for the asking.

SANGAMO

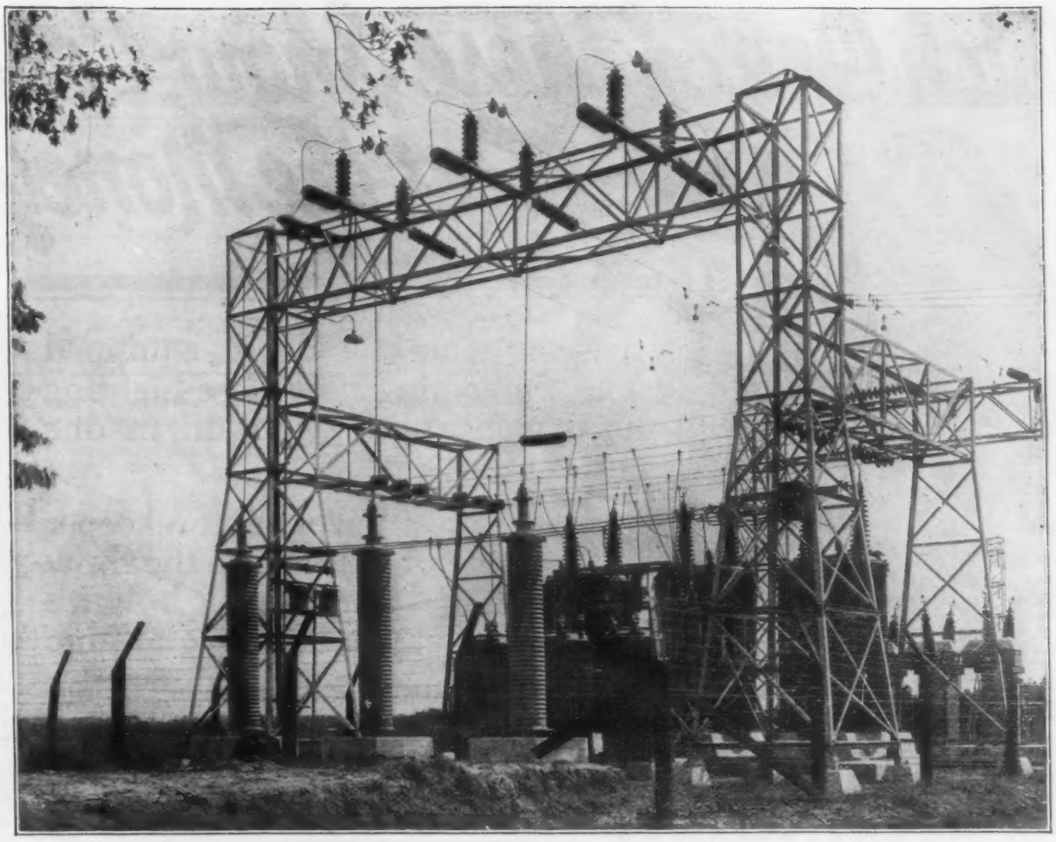
SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

New York Chicago Birmingham San Francisco Los Angeles

SANGAMO METERS

FOR EVERY ELECTRICAL NEED

6520-1



ELPECO—*now manufactures*

Bennett Lightning Arresters

600 volts to 220,000 volts

This is the time to look over your lightning protective apparatus — as the lightning season is here.

Get data on the Bennett arrester

for the good of the Service

—more than a catalog

—a bulletin of engineering information—giving sizes, dimensions and all necessary data bearing on the subject of lightning arrester protection.

ELECTRIC POWER EQUIPMENT CORPORATION
412-420 NORTH EIGHTEENTH ST. PHILADELPHIA, PA.

Write for a copy now

Western Representatives: C. E. INGALLS, Rialto Bldg., San Francisco, Cal.; EICHER & BRATT, 2107 L. C. Smith Bldg., Seattle, Wash.

Which One of these Show Cases Would Get the Money?

It is the same show case, equipped with Benjamin Show Case Lighting Equipment, with lights off in one and on in the other.

It is easy to convince the storekeeper of the value of lighting up the show case, but he doesn't know how it's done and that you can do it for him.

There are hundreds of prospects and a nice profitable business right at your doorstep when you are equipped to install these fixtures.

Benjamin Show Case Lighting Equipment

Easy to sell and easy to install. In sections, completely wired. Joined electrically and mechanically for any length of show case, by simply tightening two machine screws.

BENJAMIN ELECTRIC MFG. Co.

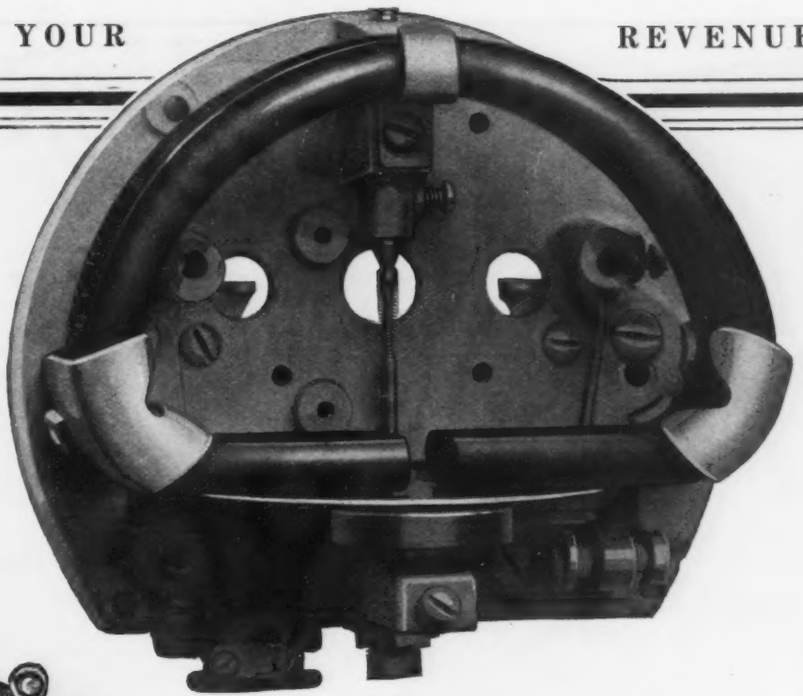
847 W. Jackson Blvd., Chicago

247 W. 17th St., New York

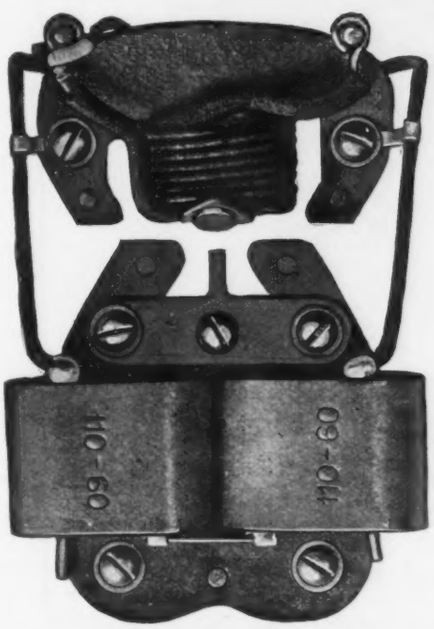
580 Howard St., San Francisco

We have a complete selling plan which is yours for the asking. Write our nearest office today.

SAFEGUARDING YOUR REVENUE



This is the first of six advertisements showing the exceptional engineering and construction features of Duncan Model M. 2 meters. The high reputation for maintained accuracy established by this meter is largely due to the correct design of the magnetic system.



Every care is taken to insure the proper insulation of the electro-magnets. For example, the potential coils after being mounted on the core are thoroughly dried in an oven and while still warm are half submerged in a high-grade insulating varnish and allowed to stand in this position until the varnish emerges from the top of the coil through capillary attraction. This insures the varnish reaching the innermost parts of the coil eliminating all air spaces. The electro-magnet is then entirely submerged, after which it is baked in an oven until it is thoroughly dry. This makes an electro-magnet which is strong mechanically and electrically and reduces to a minimum the possibility for shorts or opens in the windings.

How the DUNCAN Magnetic System Makes for Accuracy *Initial and Maintained*

The single permanent magnet of the M. 2 has an exceptionally high permanency factor. Made of the best magnet steel obtainable, the heat treating magnetizing and ageing are performed as dictated by twenty years specialized experience. Placed well to the front, a generous distance from the electro-magnets and from the grid, which acts as a shield, it is held by brass clamping shoes so constructed that it can be removed and replaced without disturbing alignment or accuracy of adjustment by more than a small fraction of one per cent. During the ten years this design has been followed, no magnet has ever been replaced because of loss of strength under normal conditions of service.

Similar excellence characterizes the electromagnetic equipment.—

The use of a relatively strong potential field and a relatively weak current field reduces the damping effect of the current electro-magnet and consequently the M. 2 meter has a remarkable overload characteristic, being only from 7 to 11 per cent slow on 400 per cent load. This is not obtained at the sacrifice of torque or voltage characteristics for the torque developed in the M. 2 meter is 40 millimeter grams, while the voltage error is less than one-half per cent for a ten per cent increase or decrease from normal voltage.

DUNCAN ELECTRIC MANUFACTURING CO.
LAFAYETTE, IND.

ANNOUNCEMENT

The Jeffery-Dewitt Insulator Co.

of Kenova, West Virginia

and

The Champion Switch Company

of Buffalo, New York

Announce the opening of a Joint District Office at

924 MARQUETTE BUILDING

CHICAGO, ILLINOIS

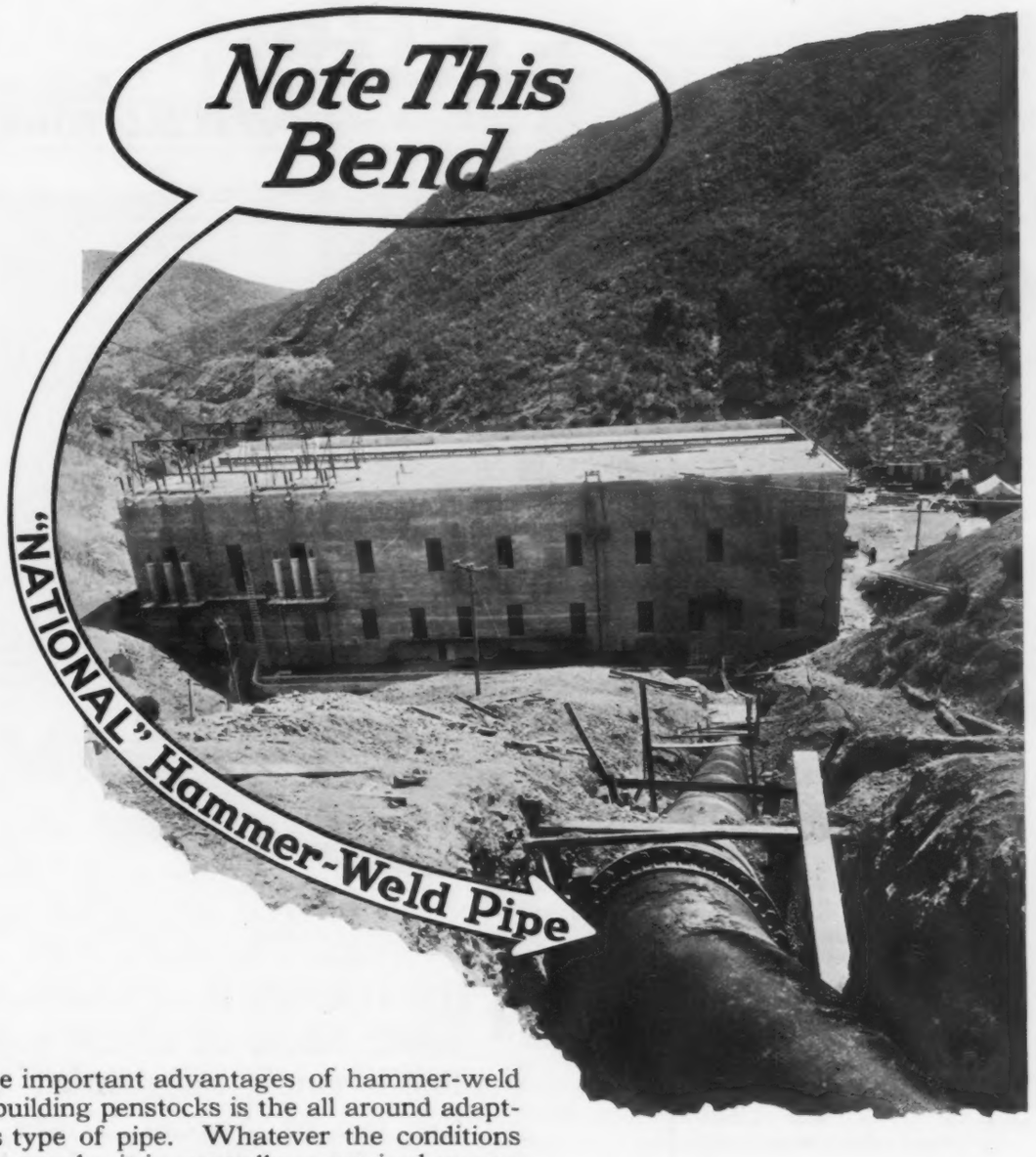
Telephone: Randolph 2660

Under the direction of MR. G. R. SCOTT, District Sales Manager

A complete line of samples of insulators for suspension and post type service, indoor bus supports, and various lines of switching equipment will be on display.

To this will soon be added an additional line of one-piece thick porcelain insulators for voltages up to 50,000, equally adapted to pin type service, outdoor bus supports and switch mounting.

We Welcome An Opportunity to Serve You



ONE of the important advantages of hammer-weld pipe in building penstocks is the all around adaptability of this type of pipe. Whatever the conditions of installation may be, it is generally recognized among engineers that they can be met more efficiently and ultimately more economically with hammer-weld construction. For instance, this bend not only saves the use of fittings, but keeps down to a minimum any friction loss, because of the smooth interior surface—unbroken by long rows of rivet heads, overlapped seams, etc.

This is only one of several advantages of "NATIONAL" Hammer-weld Pipe outlined in Bulletin No. 13. Made in sizes 20 to 96 inches, wall thicknesses ¼ inch to 1½ inches and various types of joints.

Ask for This

BULLETIN No. 13—which contains a complete description of manufacture, service and installation advantages.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

General Sales Offices: Frick Building

DISTRICT SALES OFFICES

Atlanta Boston Chicago Denver Detroit New Orleans New York Salt Lake City Philadelphia Pittsburgh St. Louis St. Paul

PACIFIC COAST REPRESENTATIVES: U. S. Steel Products Company San Francisco Los Angeles Portland Seattle

EXPORT REPRESENTATIVES: U. S. Steel Products Company New York City

Built of
SPECIAL TOWER STEEL

SPECIAL TOWER STEEL
is the tough, ductile High Elastic Limit Steel developed by Pacific Coast Steel Company. It is used for

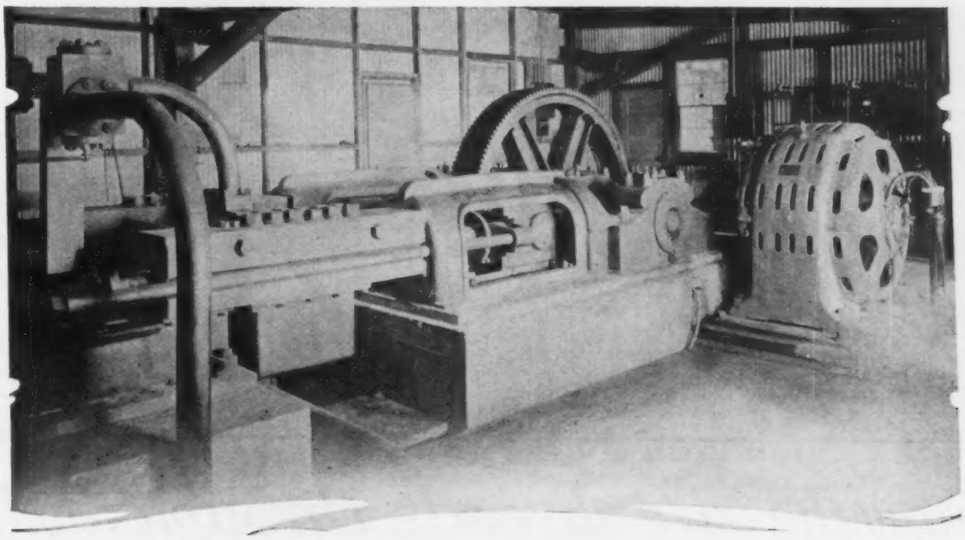
Transmission Towers
Latticed Poles
Bus Structures
Switch Racks—Platforms
Radio Towers
Electric Sign Supports

THE DANGER of transmission tower failure at critical points in the line is amply safeguarded against by the use of Special Tower Steel, because of its resiliency and resistance to fatigue year after year.

PACIFIC COAST STEEL COMPANY
MANUFACTURERS OF
OPEN HEARTH STEEL
STRUCTURAL SHAPES MERCHANT AND REINFORCING BARS
TRANSMISSION TOWERS AND STRUCTURES
Gen'l Office: Rialto Bldg., San Francisco Plants: San Francisco, Portland, Seattle

"The Structures that Go Together"

SKF



Municipal Cotton Press

Los Angeles Harbor—San Pedro—California

SPECIFICATIONS

MOTOR—300 H. P. FAIRBANKS-MORSE ball bearing motor, 3 phase —60 cycle—440 volt—slip-ring.

Which drives through flexible coupling to herring bone pinion and gear.

PUMP—4½" x 15" duplex high pressure pump operating.

COMPRESSOR—Plunger—24"; Stroke —7"; Pressure Plate—43" x 22".

This machine compresses both from the ends and sides a 500 pound bale of cotton reducing it from original dimensions of 36" x 30" x 56" to 22" x 30" x 48".

A large part of the cotton produced in the Imperial Valley in Southern California and Arizona is compressed in this press.

Our engineers will gladly aid in solving your bearing problems.

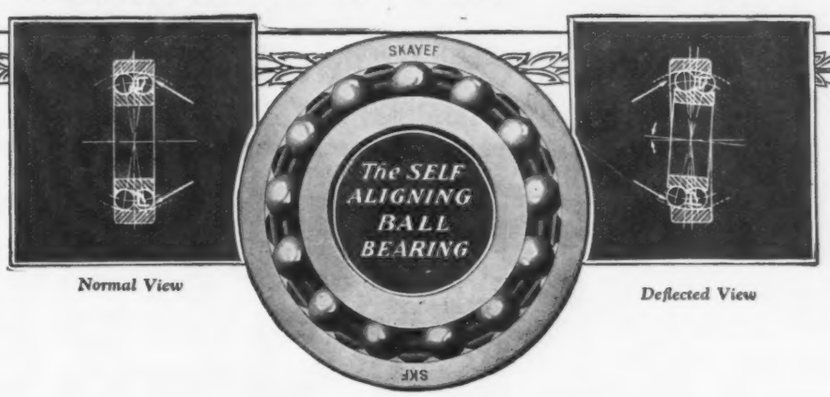
SKF INDUSTRIES OF CALIFORNIA, INC.

115 New Montgomery St.
San Francisco
Phone: Sutter 4196

(A complete Line of Radial and Thrust Ball Bearings Carried in Stock)

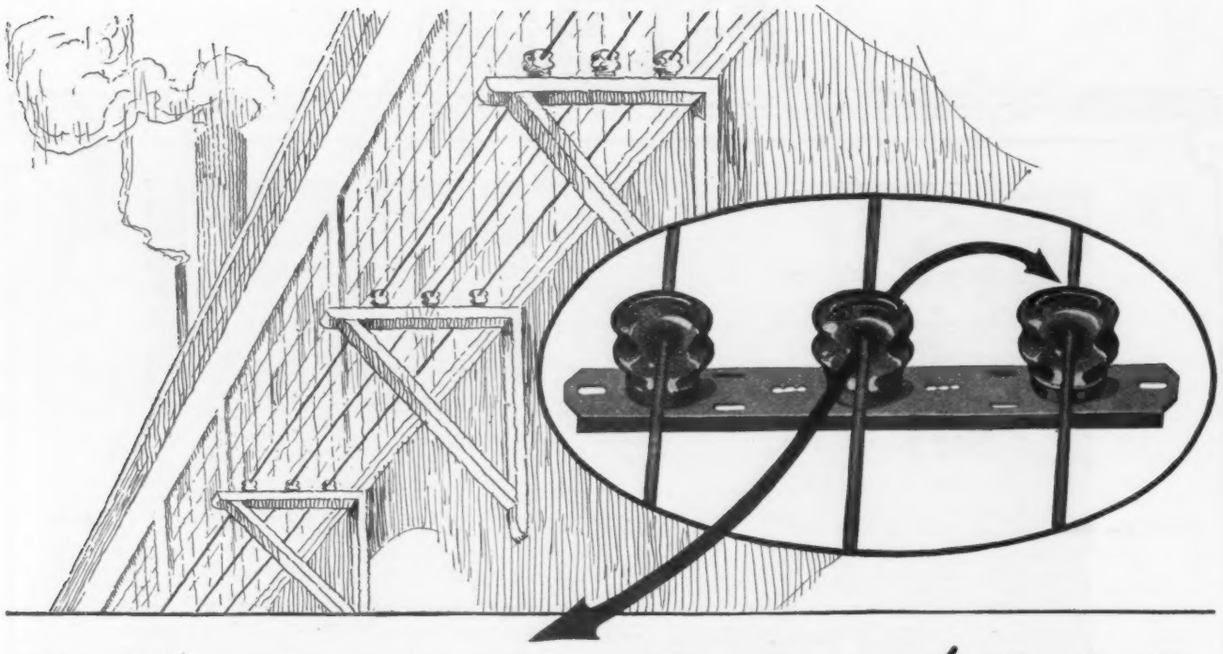
1114 South Hope St.
Los Angeles
Phones: 875-365

1132



Normal View *Deflected View*

BALL BEARINGS
The Highest Expression of the Bearing Principle



See how the wire threads through the hole

NATIONAL PRODUCTS

Wherever Wire and Structure Meet

National Products

NATIONAL RIGID CONDUIT
For high grade wiring

SHERARDUCT
Protected by both zinc and enamel

ECONOMY
Protected by enamel only

FLEXSTEEL ARMORED CABLE and CONDUIT
For high class work at minimum cost

FLEXTUBE NON-METALLIC CONDUIT
For knob and tube wiring and the like

NATIONAL METAL MOLDING and FITTINGS
For circuit extensions and surface wiring

NATIONAL INSULATING BRACKETS
For service entrances and similar uses

NATIONAL CONDUIT and CABLE FITTINGS
Locknuts—Bushings—Box connectors and other items

NATIONAL OUTLET BOXES
a box or cover for every need

LIBERTY WIRES, CABLES and CORDS
For 600 volts or less

LIBERTY AUTOMOBILE WIRE
AUTO-STEELFLEX METAL CONDUIT
For the electrical circuits of motor vehicles

NATIONAL CARBURETER, HEATER and EXHAUST TUBING
For motor vehicles

THREAD it through the hole—that's all there is to running wires with these labor and time saving **National Brackets.**

From massive mill to cozy bungalow, wherever outside wiring is to be lead to buildings, you can do it easier, quicker, far better and at less cost, with **National Brackets.**

Wires can be run, attached or merely threaded—from any angle. And every insulator is designed to withstand a load of 350 lbs. Break off an insulator and there still remains a stout U-bolt that holds the wire secure.

National Brackets first of all are built for enduring service. And then they give you in addition a new standard of convenience and substantial economy.

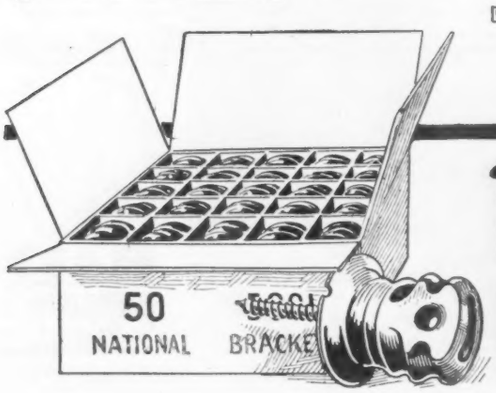
National Metal Molding Company

WORLD'S LARGEST PRODUCERS OF ELECTRICAL CONDUITS AND FITTINGS

1127 **Fulton Building, Pittsburgh, Pa.**

Represented in All Principal Cities

(s)



National Brackets

The World's First Twin-Motor Locomotive for O-Gauge Track

Another Example of Lionel Leadership in Miniature Electric Railroading

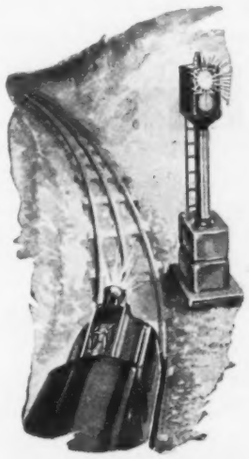
WHERE is the boy who can resist this wonderful Lionel *Twin-Motor* reproduction of the famous New York, New Haven and Hartford electric locomotive—

A new electric locomotive for O-Gauge track that has *more power* and is more like the real thing than has ever been produced before.

It has two headlights; each with an individual switch; nickeled pantagraph, whistle and journals; polished brass window frames, ventilators and side panels; model compressed-air tanks; and the new Lionel Automatic Couplers.

Think of the thousands of boy owners of O-Gauge train outfits who have been adding more cars, more track—just waiting to get a locomotive with the power of this new Twin-Motor Lionel.

And notice that again *Lionel* is ahead—giving dealers additional opportunity for increased sales and greater profits.



The LIONEL AUTOMATIC TRAIN CONTROL

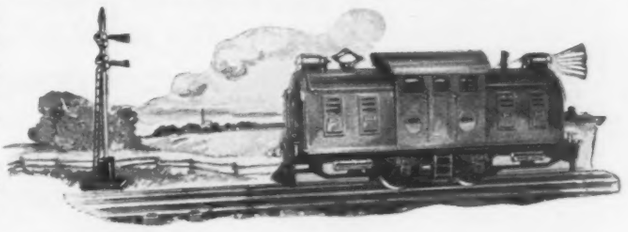
A marvelous display feature that holds the crowd spellbound. Stops and starts trains automatically. Works continuously without attention.

Also Don't Overlook This New Single-Motor O-Gauge Locomotive

Here is a splendid new Single-Motor Locomotive, and there are still other new models described in our catalog.

One look at these beautiful miniature locomotives tells the story of Lionel leadership. They have gone beyond the *toy* stage and captured the hearts of American boys by giving them trains that are "just like the big ones", and sell at—

Lowest Prices in Lionel History



The LIONEL CORPORATION

48-52 East 21st Street, New York City

Western Coast Representative

M. Sweyd, 180 New Montgomery Street, San Francisco, Calif.

"Standard of the World Since 1900"

LIONEL ELECTRIC TOY TRAINS

& Multivolt Transformers

Simplify Your Selling

THE five year guarantee on Emerson Fans simplifies the job of selling.

To the buyer the written guarantee of service is the final test of value.

The five year guarantee on Emerson Fans simplifies the job of selling the best.

Seventy distributors, located at convenient points, carry EMERSON FANS. Wire our expense, for name of nearest one.

The Emerson Electric Mfg Co.

2018 Washington Avenue

50 Church Street
New York City

St. Louis, Mo.

The Only
LIGHT-PAL

For the Nation's 30,000,000 Smokers When they Read, Write or Play

TO the alert dealer that brings a vision of big sales for this lamp which gives friendly light comfort to a fellow when and where he wants it.

Show them lighted in your store window, on the shelf or counter and they will sell themselves. Thousands are doing it. So can you.

Lees' Lamp for Smokers, which is a unique combination of Lamp and Ash Receiver, and Lees' Clampable Ash Receiver are two beautiful and distinctive specialties, and they are the only products of their kind and class.

They are extensively advertised in national magazines and a dealer is supplied with much selling help in the way of displays and direct mail advertising. Of course they sell big when a lively dealer shows them up.

Lees' Smokers' Lamp

K. F. LEES COMPANY

New Haven, Conn.

Allied Industries, Inc., Distributors, Pacific Coast
San Francisco, Los Angeles, Portland, Seattle

LEES' ASH RECEIVER—

Clamps Anywhere With a Velvet Grip

This is the only CLAMPABLE Ash Receiver on the market. Swivel clamp allows bowl to be placed above or below table or at any angle. Will not mar finest finish. Holds securely—cannot tip over. Saucer shaped cover guides ashes inward but prevents them from escaping. Trimmings highly buffed nickel. Bowl finished in six beautiful colors; Brushed Brass, Mahogany, Ebony, Statuary Bronze, Verde Green, Old Ivory. Retail $3.50.

Are You Using the Right Chain for Your Drive?

DURING the past fifty years we have designed and manufactured all types of drive chains—the malleable iron detachable Link-Belt in all its many varieties, the "combination" malleable iron and steel chains, the heavier, more rugged types of all-steel chains, the finished steel roller chains and the highly efficient Link-Belt Silent Chains.

We are therefore perfectly free to recommend the type of chain which will most effectively and most economically accomplish the results. It is a matter of pride with us that our judgment as to the correct use of a chain is sought by many experienced users of chain.

Let us help you. There is a standard Link-Belt chain for every power transmission service. We can show you when and where to use each to get the utmost in trouble free service.

Catalogs and particulars on request. Address nearest office.

This Trade Mark Identifies Genuine Link-Belt Chain

1562

LINK-BELT MEESE & GOTTFRIED CO.

San Francisco.....19th & Harrison Sts.
Seattle, Wash.....820 First Ave., S.
Los Angeles, Calif.....400 E. Third St.
Portland, Ore.....67 Front St.

LINK-BELT

DIRECTORY of ENGINEERS

The Journal of Electricity's selected list of Engineers equipped to handle Hydro-Electric and Industrial Development now under way in the West

BYLLESBY
ENGINEERING & MANAGEMENT CORPORATION
208 S. La Salle Street, Chicago
New York Tacoma

FORD, BACON & DAVIS
Incorporated
ENGINEERS
115 Broadway, NEW YORK
Philadelphia Chicago San Francisco

LOUIS F. LEUREY
INDUSTRIAL APPLICATIONS OF ELECTRICITY
58 Sutter St. San Francisco, Cal.

JAMES R. CRAVATH
Consulting Illuminating Engineer
1113 Macdonald Avenue, Richmond, Calif.
San Francisco Conferences by Appointment
Telephone Richmond 17 Formerly of Chicago

G. M. GEST
Constructors of Electrical Underground Conduit Systems.
Founded 1896
503 Market St., San Francisco, Cal.

DWIGHT P. ROBINSON & CO., Inc.
Design and Construction of Steam Power Stations, Hydro-Electric Developments, Industrial Plants
Union Oil Building, Los Angeles
New York Chicago Youngstown
Philadelphia Montreal Rio de Janeiro
Atlanta, Ga.

Your Card —
In the Directory of Engineers offers a type of publicity entirely in accord with the ethics of professional men. Let us submit our rates for this space.

Engineers—
or engineering organizations interested in securing recognition as prospective builders of the West should appreciate the value of representation in this directory.

SANDERSON & PORTER
Established 1896
Design and Construct
Organize, Manage, Operate and Finance
PUBLIC UTILITIES AND INDUSTRIALS
14 Montgomery St., San Francisco
New York Chicago

ELECTRICAL TESTING LABORATORIES
Electrical, Photometrical, Chemical and Mechanical Tests. Inspections of Materials and Apparatus at Manufactory.
80th Street and East End Avenue
New York

GEORGE L. HOXIE
CONSULTING ENGINEER
Rate and Condemnation Cases, Valuations, Reports.
831 San Fernando Building, Los Angeles

THEBO, STARR & ANDERTON, INC.
ENGINEERS AND CONSTRUCTORS
Specializing in Design and Construction of Power Plants, Hydro-Electric, Irrigation and Industrial Projects
Appraisals, Investigations, Reports, Plans and Specifications
Sharon Bldg., San Francisco Fresno, Cal.

WHY NOT PARTAKE—
of the service rendered by the Professional Directory of the Journal of Electricity? It is a dignified way of keeping your name before the public.

ARTHUR R. KELLEY
CONSULTING ENGINEER
Reports and Valuations, Public Utility and Industrial Properties
Nevada Bank Bldg. San Francisco

THE J. G. WHITE ENGINEERING CORPORATION
Engineers—Constructors
Oil Refineries and Pipe Lines, Steam and Water Power Plants, Transmission Systems, Hotels, Apartments, Office and Industrial Buildings, Railroads.
43 Exchange Place New York

THE intensiveness with which the Journal of Electricity covers the electrical field in the West makes it an advertising medium second to none in the advertising of any product associated with electricity in the eleven Western states. The aim of the advertising department is to cooperate, in any way possible with advertisers, to the end that the best results may be obtained from the use of space in the Journal.

COPPER WIRE
Bare and Insulated for every kind of electrical work.
COPPER RODS TROLLEY WIRES
Rome-Wire
ROME WIRE COMPANY
Main Plant and Executive Office, ROME, N. Y.
"Diamond" Branch BUFFALO, N. Y.
DISTRICT SALES OFFICES
NEW YORK, 50 Church St.
CHICAGO, ILL., 14 E. Jackson Blvd.
DETROIT, MICH., 25 Parsons St.
LOS ANGELES, CAL., J. G. Pomeroy, 336 Azusa St.

TRANSFORMERS
THE PACKARD ELECTRIC CO.
WARREN, O.
BUILDERS OF TRANSFORMERS SINCE 1890

Ready Reference for Western Buyers

ALEXANDER AND LAVENSON ELECTRICAL SUPPLY CO.

Bluebird Electric Clothes Washers
Williamson Lighting Fixtures
Manning-Bowman Heating Appliances
Square D Switches
Noark Fuses
Bryant Material
Westinghouse Lamps
Insulating Supplies
Yale Flashlights
Benjamin Industrial Lighting
Robbins & Myers Products
Russell Holdheet Appliances
Hubbell Devices

926 Howard Street,
SAN FRANCISCO, CAL.

John A. Roebling's Sons Co. of California

San Francisco Los Angeles
Portland Seattle

Wire Rope
Blocks and Fittings
Electric Wires and Cables
Wire Cloth and Netting
Wire Products

Listenwalter & Gough, Inc.

JOBBERS OF
ELECTRICAL SUPPLIES

Distributors for
Royal Electric Cleaners
Standard Electric Ranges
Manning-Bowman Heating Appliances
Zenith Radio
Lincoln and Williamson Fixtures
Royal Monax Lighting Units
Yale Flashlights

SAN FRANCISCO LOS ANGELES

NEW YORK CHICAGO SEATTLE

FEDERAL
Electric Company

Electric Signs
Electric Washing Machines
Electric Vacuum Cleaners
Electric Supplies

Western Factory
Emeryville Station, Oakland, Calif.
Sales Offices
94 New Montgomery St., San Francisco
529 Electric Bldg., San Diego
118 East Third Street, Los Angeles
2718 Elliott Avenue, Seattle, Wash.

SAN FRANCISCO
OAKLAND LOS ANGELES SAN DIEGO

The Montana Electric Co.
Butte, Montana

The Washington Electric Supply Co.
Spokane, Washington

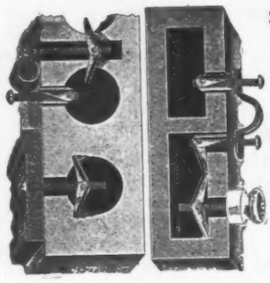
Distributors For
Anaconda Copper Mining Co.
"A & F" Water Heaters and Covers
Hurley Machine Co.
Crouse Hinds Co.
Landers, Frary & Clark
Chicago Insulated Wire & Mfg. Co.
W. N. Matthews
Bryant Electric Co.
Radio Corporation of America
Westinghouse Electric & Mfg. Co.
Westinghouse Lamp Co.
R. Williamson & Co.

REIMAN WHOLESALE ELECTRIC COMPANY

Jobbers and Distributors
—of—
WIRING MATERIALS
APPLIANCES
GLASSWARE and FIXTURES
RADIO SUPPLIES

224-228 East Third St.,
Los Angeles, Calif.

PAINE TOGGLE BOLTS
"THE PRACTICAL TOGGLE"



Save Their Cost in Time and Patience

THE PAINE CO.
2951 Carroll Ave.
CHICAGO

Work Instantly
In Any Position In Any Hollow Material

ELECTRIC SUPPLY CO.

404—11th St., Oakland, California

JOBBERS OF ELECTRICAL SUPPLIES

DISTRIBUTORS FOR
Star Rite Heating Appliances
Trumbull-Vanderpoel Switches
Buckeye Conduit
Beaver Household Electrical Appliances
Arrow Socket Materials and Switches
Appleton Electric Company Unilets
Armstrong Table Stoves
Abolite Steel Reflectors

Wholesale Electric Co.

817 Mission St., San Francisco
Wholesale Only
A. R. Fierce, Prop.

DISTRIBUTORS OF
The Apfel Systems of Electric Heating;
—including—
100% Electric Radiators;
Recessed Registers;
"Coppersert" Water Heaters;
Glue Pots, Circoflectors, etc.
—ALSO DISTRIBUTORS OF—
Thompson Neutrodine Radio Receiving sets; and
JOBBERS OF
Standard Electrical Materials.

MYERS ELECTRIC SUPPLY CO.
Los Angeles

Hocking Illuminating Glassware
Macbeth Evans Monax & Alba Glassware
Arrow Electric Co. Wiring Devices
Sutler-Hammer Mfg. Co. Products
Phoenix Glass Co. Illuminating Glassware
Daylite Tungsten & Gas Filled Lamps
Cleveland Electric Vacuum Cleaners
Metropolitan Dead Front Panel Boards
Dunlap Steel Enameled Reflectors
Colonial Lighting Fixtures and Brackets
Appleton Electric Products
Killark Electric Products
Paracore Rubber Covered Wires

1727-1731 S. Los Angeles Street

ELECTRICAL SPECIALTY COMPANY, Inc.

Pacific Coast Representatives:
Mica Insulator Company
Corliss Carbon Company
Bakelite Corporation

San Francisco and Seattle Offices—
Continental Fibre Company

Pacific Coast Stocks Carried:
Bakelite-Dilecto
Mica Insulating Materials
Monarch Refillable Fuses and Links

Los Angeles Office: 411 So. Main St.
San Francisco Office: 61 Fremont St.

Seattle Office:
1041 Sixth Ave. So.

THEO F. DREDGE
POWER PLANT EQUIPMENT

RICHARDSON-PHENIX
OIL FILTERS AND OILING SYSTEMS
PITTSBURGH
PIPING INSTALLATIONS, BENDS
ECONOMY
PUMPS AND SEWAGE EJECTORS
COFFIN
SLUICE GATES, VALVES, HYDRANTS
McALEAR
PRESSURE REGULATORS, VALVES
TYLER
EXPANSION JOINTS, CONDUIT, METERS
FALLS
ENGINE AND TURBINE STOPS

817-19 MONADNOCK BUILDING
SAN FRANCISCO

Ready Reference for Western Buyers

Electric Appliance Co.

SAN FRANCISCO

JOBBERS OF ELECTRICAL, AUTO AND RADIO SUPPLIES

DISTRIBUTORS FOR

Packard Lamps
Parac Rubber Covered Wire
"O. K." Weatherproof Wire
Eden Washing Machines
Bryant and Perkins Material
Union Refillable Fuses
Universal Heating Goods
Universal Washing Machines, Ranges and Vacuum Cleaners
Trumbull Circle "T" Switches
Sheraduct and Economy Conduit
Crouse-Hinds Material
Emerson Motors
Everhot Electric Hot Water Systems

LOS ANGELES PORTLAND SPOKANE
OAKLAND SAN FRANCISCO SEATTLE

PACIFIC STATES ELECTRIC COMPANY

DISTRIBUTORS FOR

Anaconda Copper Mining Co.
Chance Company (Never-Creep Anchors)
Crouse-Hinds Company Edison Mazda Lamps
Edison Electric Appliance Co., Inc.
Electric Vacuum Cleaner Co.
The (Orangeburg) Fibre Conduit Co.
General Electric Wiring Devices
Hemingray Glass Company
Holophane Glass Co., Inc. Hubbard & Company
Hurley Machine Company
Illinois Wire & Cable Co.
Ivanhoe Regent Works of G. E. Co.
Locke Insulator Corporation
Radio Corporation of America
Sprague Electric Works of G. E. Co.
Wahle Company, Inc., Albert
Walker Brothers Co.

Electric Furnaces
and
Electric Heating Equipment
for all Industrial Purposes

George J. Hagan Co.

419 Call Bldg., San Francisco

Los Angeles Pittsburgh, Pa.

By placing your Ad. in the Journal of Electricity

you reach a tremendous buying power. Our advertising service department is ever anxious to serve the needs of Journal advertisers in any way possible. Let this department cooperate with you in preparing copy, in order to get the best results from your advertising.

WESTERN LIGHT & FIXTURE CO.

DISTRIBUTORS

P&S WIRING DEVICES

Hotpoint IRONS and APPLIANCES

G. I. MAZDA LAMPS
VIRDEN FIXTURES
EVEREADY FLASHLIGHTS
TRUMBULL SAFETY SWITCHES

301-303 SOUTH LOS ANGELES ST.

LOS ANGELES, CAL.

ILLINOIS ELECTRIC CO.

Los Angeles
Chicago

Distributors of
Everhot Electric Hot Water Systems
Peerless Mazda Lamps
APEX Suction Cleaners
The ROTAREX Home Double Roll Ironer
The ROTAREX Unitized Electric Washer
Union Refillable Fuses
Geo. Cutter Products
Crouse-Hinds "Condulets"
New York Ins. Raven Core Rubber-Covered Wire
Westinghouse Electric Household Appliances & Power Apparatus

JOBBERS
Electrical Supplies

AGENTS FOR WESTINGHOUSE ELEC. & MFG. CO.

Mc Laughlin STANDARD GLASS Insulators

Standard Glass Insulators made by Pacific Coast factory. Satisfaction guaranteed. Now being used by largest power companies in California.

Mc Laughlin Glass Co.
Los Angeles, Cal.
Factory & Offices: cor. 52nd & Alameda Sts.

Representatives
Kierulff & Ravenscroft, Los Angeles
Maydwell & Hartzell, Inc., San Francisco and Los Angeles

SPAULDING Fibre Co.

Sheet—Rod—Tube—Fish Paper from Pacific Coast Stocks.

Special Shapes and Special Fibres from our Factories.

May we help you in problems involving the use of Fibre?

Clapp & La Moree

310 E. 4th, Main 4402, Los Angeles
171—2nd St., Douglas 7731, San Francisco

JEWELL

WESTERN REPRESENTATIVES

O. E. THOMAS & CO. LOS ANGELES
C. F. HENDERSON SAN FRANCISCO
EICHER & BRATT SEATTLE

Jewell Electrical Instrument Co.
CHICAGO

AGENTS FOR WESTINGHOUSE ELEC. & MFG. CO.

FOBES SUPPLY COMPANY

—WHOLESALE—
ELECTRICAL SUPPLIES

Portland,
Seattle,
San Francisco
and
Oakland

FOBES SUPPLY CO.

LEMCO EQUIPMENT

Manufacturers of high grade Radio sets and parts

Lee Electric & Mfg. Co.
220 Eighth St.
San Francisco

ROLLER-SMITH COMPANY

Electrical Instruments, Meters and Circuit Breakers

Main Office:
2130 Woolworth Bldg.,
NEW YORK

Works:
Bethlehem,
PENNA.

WESTERN REPRESENTATIVES

DENVER—Mountain States Machinery Co., U. S. Natl. Bank Bldg.
LOS ANGELES—Electric Material Co., Consolidated Bldg.
SALT LAKE CITY—L. Brandenberger, Dooly Bldg.
SAN FRANCISCO—Electric Material Co., 589 Howard St.
SEATTLE—Electric Material Co., Hinckley Bldg.

A comprehensive stock of Roller-Smith Instruments, both Portable and Switchboard Types, is carried in San Francisco.

SEARCHLIGHT SECTION

EMPLOYMENT-BUSINESS OPPORTUNITIES-EQUIPMENT

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 6 cents a word, minimum charge $1.25.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 4 inches.....$3.50 an inch
5 to 10 inches..... 3.40 an inch
11 to 29 inches..... 3.30 an inch

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

J. of E.

Wanted
Sales Representatives For Ironing Machine Manufacturer

Manufacturer of high grade NEW line of electrically operated ironing machines desires to secure western sales representatives. Line has many new and novel features which should arrest serious interest from interested western sales representatives. Address P 28, Journal of Electricity.

FOR SALE—8 Hydro and Steam Electric Generating Plants removed from system of the Pacific Power & Light Co.; 147 New Allis-Chalmers Motors from Government Port Angeles Spruce Mill. Your inquiries solicited. R. R. Pappleton, 35 First St., Portland, Oregon.

MANAGER desires change. Eighteen years experience, intermountain country, in operation, maintenance, construction, public relations electric utility system. Very successful. Age 40, married. Excellent references. Available reasonable notice. Address P 25, Journal of Electricity.

Wanted
Denver and Salt Lake Agents

Eastern manufacturer of high tension outdoor and indoor substation equipment. High grade line requires services of high grade man who knows the territory, is an electrical engineer and can sell the goods. Address P 29, Journal of Electricity.

Founded 1878 — OKONITE — Incorporated 1884

TRADE MARK

SPLICING MATERIALS
Make Dependable Joints

OKONITE TAPE is a rubber insulating tape for making splices or joints. Joints properly made with Okonite tape are impervious to moisture and are as strong as or stronger electrically and mechanically than the insulated wire itself.

MANSON TAPE is a rubber filled cloth tape for protecting joints against mechanical injury. It is adhesive, does not unwrap and does not corrode copper wire. Easily handled, economical to use.

DUNDEE "A" TAPE is a high quality Friction Tape—but not so expensive or high grade as "Manson."

DUNDEE "B" TAPE is also a true Friction Tape, far better than any other medium grade on the market, and meets the large demand which exists for a good tape, at a low price, for temporary installation, automobile and bicycle repairs, etc.

Send for booklet "Splices and Tapes"

THE OKONITE CO., Passaic, N. J.

PACIFIC COAST OFFICES
754 Monadnock Building, San Francisco, Calif.

SIMPLEX
WIRES AND CABLES
INSULATED WITH RUBBER, PAPER OR CAMBRIC

SIMPLEX WIRE & CABLE Co
MANUFACTURERS
201 DEVONSHIRE ST. BOSTON
CHICAGO SAN FRANCISCO

MAKERS OF "TIREX" CABLE AND CORD

See Our Full Page Next Issue

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GOOD USEABLE EQUIPMENT

25 Cycle A. C. Motors, Transformers

C. C. Transformers, Switchboards and Miscellaneous Equipment

Changes in distribution, frequency, voltage and methods have necessitated replacement of customers' motors and equipment, frequency changes, rotary converters, distribution panels, meters, etc. All of this equipment is in running condition, and is offered at extremely low prices. Many items were reserve, never having been in service

BOILERS—FIRE TUBE

Qu.	Hp.	Make	Pressure
1	150	Murray	150 lb.
4	125	Murray, Springfield Lyons, Penn.	
1-100		Frost	
1- 90		Murray	
1- 80		Penna.	

BLOWERS

2—Sturtevant exhausters, No. 5½ type A, 10,000 cu. ft.

CHOKE COILS

3—G. E. 4600-volt on marble slabs.
6—G. E. 660-volt on marble slabs.

CONDENSERS

Worthington	7,000 sq. ft.
Wheeler	8,000 sq. ft.
Wheeler	16,000 sq. ft.

ENGINES

Make	Hp.
Murray Standard Corliss	75
Murray Standard Corliss	100
Murray Standard Corliss	161
Fairbanks Morse	50 oil engine
Fairbanks Morse	25 oil engine

EXCITERS

75-kw. Turbo exciter	DeLaval
35-kw. Turbo exciter	Curtis

FANS—D.C.

Stationary — Oscillating — Exhaust Ceiling
G. E., Westinghouse and other makes.

Qu.	Size
6	6″
27	8″
27	8″
6	10″
188	12″
153	16″
11	56″ ceiling fans
Exhaust	
2	24″
1	DeVilbiss
51	56″

ENGINE GENERATORS

75-kw. Warren Electric, 3-phase, 2300-volt, 60-cycle, generator direct connected to Erie City steam engine.
18.5-kw. Engberg, 3-phase, 240-volt, 60-cycle, direct connected to Engberg vertical steam engine.
25-kw. General Electric generator, 2300-volt, 3-phase, direct connected to 4-cylinder gasoline engine.

GENERATORS

180-kw. Westinghouse, 2300-volt, 3-phase, 60-cycle.
90-kw. Westinghouse, 2080-volt, 3-phase, 60-cycle.
75-kw. Westinghouse, 2200-volt, 3-phase, 60-cycle.
75-kw. Elec. Mach., 2300-volt, 3-phase, 60-cycle.
50-kw. Westinghouse, 2300-volt.
45-kw. Gen. Elec., 125-volt, D.C.
30-kw. Fair. Morse, 2300-volt, 3-phase, 60-cycle.
25-kw. Gen. Elec., 2300-volt, 3-phase, 60-cycle.
15-kw. Fair. Morse, 2300-volt, 3-phase, 60 cycle.

LIGHTNING ARRESTERS

Qu.	Make	Type	Volts
2	Gen. Elec.	H	6900
1	Gen. Elec.	H	4600
1	Gen. Elec.	H	9200

CABLE

No. 6	2300-vole,	3-cond.,	on	hand		1,600 ft.
No. 2	2300	" 3	"	"	"	3,000 ft.
1/0	6600	" 3	"	"	"	190 ft.
2/0	6600	" 3	"	"	"	967 ft.
3/0	6600	" 3	"	"	"	7,000 ft.
No. 4	13,200	" 3	"	"	"	3,800 ft.

FREQUENCY CHANGERS

150-kva. General Electric
Generator, 2300 volt, 62½ cycle.
Motor, 2300 volt, 25 cycle.
3—500-kva. General Electric
Generator, 2400 volt, 62½ cycle.
Motor, 6600 volt, 25 cycle
1000-kva. General Electric
Generator, 2400 volt, 62½ cycle.
Motor, 6600 volt, 25 cycle
1250-kva. Westinghouse
Generator, 2400 volt, 62½ cycle.
Motor, 6600 volt, 25 cycle

ROTARY CONVERTERS

1—750-kw., 275-volt, 250-r.p.m., 25-cycle, type HC.
1—G. E. transformer, 825-kva., 3/6 phase, 6600/186 volts.
1—1500-kw., 275-volt, 214-r.p.m., 25-cycle, type HC.
3—Maloney single-phase transformers, 750-kva., 13200-460/220-volt, 25-cycle.
1—1500-kw., 225-275 volts, 214 r.p.m., 25-cy., type H.C.B. with G. E. transformer, 1650-kva., 3/6-phase, 6600-186-volt.
1—2000-kw., 225/300 D.C. volt, 300 r.p.m., 25-cycle, type HCC.
1—G. E. transformer, 2200-kva., 3/6-phase, 6930-195 volts.
2—200-kw., 125-volt, D.C. transformer for 25-cycle side.
All above with equipment necessary for operation.

INDUCTION REGULATORS

Qu.	Make	Amps.	Phase	Voltage
1	Westing.	150	1	2200
1	Gen. Elec.	150		2200
1	Gen. Elec.	150	3	2200

METERS

Qu.
116—Twenty-five-cycle watthour meters, General Electric and Westinghouse, two and three-wire, single and three-phase, 5 to 1000 amps.
814—D.C. watthour meters, General Electric and Westinghouse, two and three-wire, 5 to 300 amps., type M.

A large number of Direct Current fans and fractional horsepower motors are also on hand. Whether your requirements are shown here or not, get in touch with us; we have considerably more equipment.

D.C. AMMETERS

Qu.
32—Thompson, General Electric and Weston from 0 to 10 amps. and 0 to 12000 amps.

A.C. AMMETERS

Qu.
9—Thompson, from 0 to 10 and 0 to 300 amps.

MOTORS—D.C.

D.C. Elevator motors.
Otis and other makes of elevator motors, various sizes, prices low enough to purchase for spare equipment.

3-Phase, 25-cycle Motors, Squirrel Cage, Standard Makes

Qu.	Qu.	Qu.
10-15-hp.	15-50-hp.	1-450-hp.
4-30-hp.	3-60-hp.	
15-35-hp.	11-75-hp.	
12-40-hp.	9-100-hp.	

Slip Ring

Qu.
19—15 to 750-hp. Std. speeds.

3-Phase, 25-Cycle Vertical

1 to 20-hp.

PUMPS

1	DeLaval	35-ft. head	500 G.P.M.
1	DeLaval	375-ft. head	500 G.P.M.
1	DeLaval	500-ft. head	1650 G.P.M.
3	Platt	180-ft heat	500 G.P.M.
1	Platt	35-ft. head	1800 G.P.M.
4	Small boiler feed pumps		

RELAYS

Qu.
13—5-amp., 1-phase, 25-cycle, overload.
3—G. E. relay panels.

SWITCHES

Qu.
37—**Knife.** Standard makes, 20 to 16000 amps., 110 to 500 volts.
125—**Oil.** Standard makes, 100 to 600 amps., 2500 to 16,500 volts. Without switchboard, relays or operating handles.
6—**Remote Control.** G. E., 15000-volt, 300 amps., with motor.

TRANSFORMERS

Distribution

Twenty-five-cycle (will open on 60-cy.), single and three-phase, 2300-6600-volt primary, 110-220, 220-440 volt, 1 to 375-kw.

Constant Current

Qu.
5—Westinghouse, 25-cycle, 8 to 48-kva., 6300 to 6600-volt, 4 to 6.6 amps.
11—Westinghouse and G. E., 60-cycle, 68 to 70-kva., 2200 to 2540-volt, 6.6 amps.

Instrument

8—G. E., 1500 to 15000-volt, 5 to 10 amps.

G. E. CURRENT TRANSFORMERS

Qu.
98—2500-volt, 30 to 600 amps., ratios from 6/1 to 80/1.
39—7500-volt, 10 to 1500 amps., ratios from 2/1 to 300/1.
100—15000-volt, 5 to 400 amps., ratios from 1/1 to 80/1.

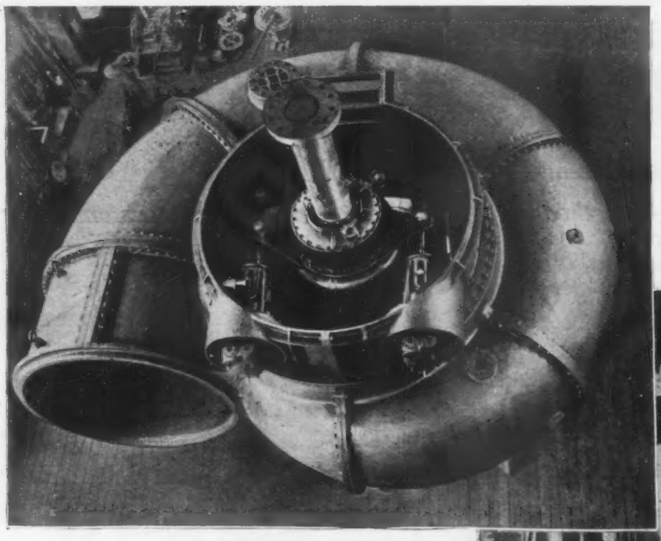
GENERAL ELECTRIC 25 to 125-CYCLE POTENTIAL TRANSFORMERS

Qu.	Volts	Watts
2	440-110	50
34	2200-110	200
14	4400-110	200
30	6600-110	200
3	13000-110	200

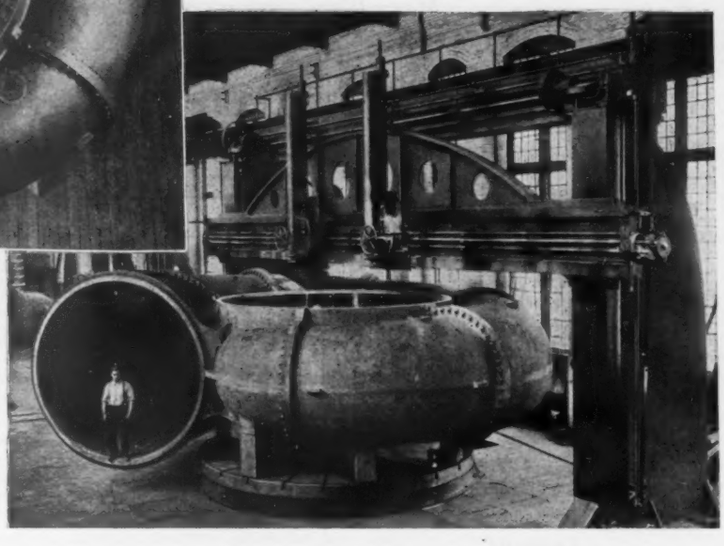
Address all inquiries to W. C. BLAIR, Industrial Engineer

KANSAS CITY POWER & LIGHT COMPANY

1330 Grand Avenue, Kansas City, Mo.



Accompanying views show one of four SMITH HYDRAULIC TURBINES recently furnished Georgia Railway & Power Co., for their Tugalo development; also, one of the 10 ft. inlet cast iron spiral cases on 35 ft. boring mill. EACH UNIT DEVELOPS 20,000 H.P. AT 171.4 R.P.M. UNDER 150 FT. HEAD.



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San Francisco Office, 461 Market St.

Catalogue
No. 105
Patented

The new Levolier White Glazed Porcelain Bracket is now ready for delivery. For bathrooms, kitchens, hospitals and other places where a white, sanitary fixture is desirable, this fixture is making the big impression of the year.

The lever serves as the operating control and as a finishing knob, doing away with the unsightly key or dangling chain.

Announcing-The Levolier
White Glazed Porcelain Bracket
Levolier
Cat. No. 105
Patented
and Patents Pending
Artistic - Sanitary - Durable
For bathrooms, kitchens, hospitals and other places where a white sanitary fixture is desirable.
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MANUFACTURING CO.
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VALPARAISO · INDIANA
Sold in Canada by W. H. Banfield & Sons, Ltd., 370 Pape Ave., Toronto, Ont.

Catalogue
No. 105
Patented

The position of the fixture may be reversed so that the lamp hangs straight down.

The canopy and socket are white glazed porcelain, an everlasting finish. All exposed metal parts are finished in polished, rust-proof nickel, better to harmonize with surroundings.

Write for complete description and prices so that you may be the first to offer this popular number in your community.

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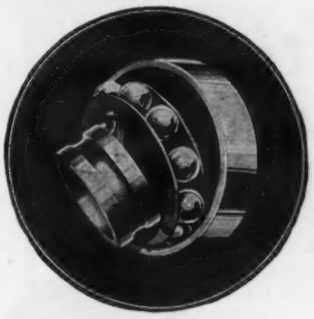
MAKE GOOD MOTORS BETTER

"NORMA"



They strengthen the weakest point in a motor—the shaft bearings. They minimize the chief source of motor troubles—friction and wear in the bearings. They make possible, in a motor, a higher electrical and mechanical efficiency. They contribute materially to longer life, better performance, lower upkeep and operating cost.

Their unequaled stand-up-ability is the result, not alone of their unmatched precision of dimension and finish, but also of their perfected design and extreme care in selecting and treating the materials entering into them.

They are not "cheap" bearings, but they are highly inexpensive — as service records prove. May our engineers work with yours?

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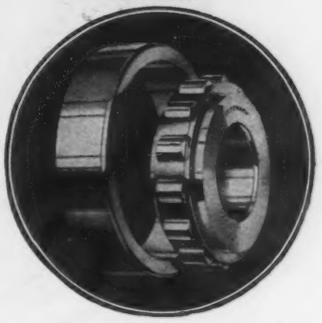

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Open and Closed Types

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For heavy loads and hard service, with a load capacity far beyond that of any ball bearing, these are pre-eminently the bearings to use where the operating conditions are most difficult.

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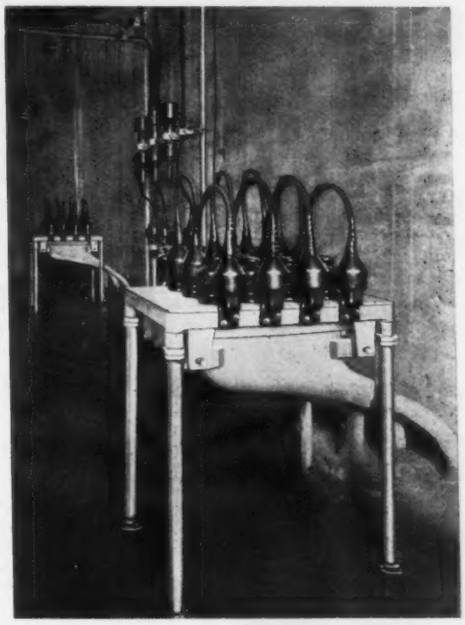

POTHEADS, DISTRIBUTION BOXES

Switching Tables

Several large companies are using G and W Switching Tables in transformer vaults for switching transformer connections to either one of two incoming circuits.

For this work the proper potheads and switching boxes are mounted on switching tables. Connections between potheads are by flexible jumper. Connections on the boxes are a cap covering which connects the two adjoining conductor outlets. The boxes are submersion proof. The potheads may be if lead covered jumpers are used.

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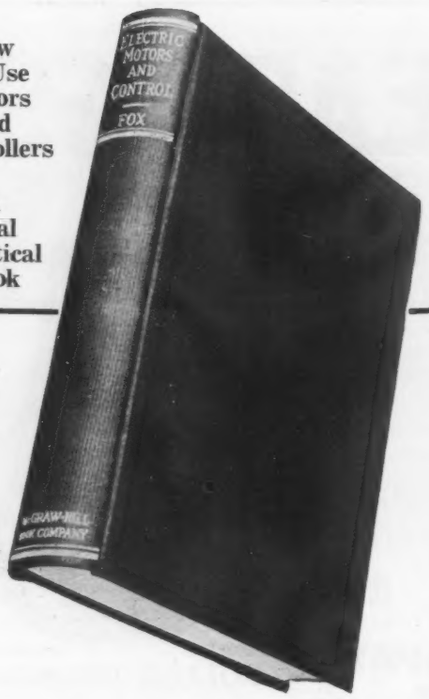
How To Use Motors and Controllers

A Real Practical Book



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—how to get the best starting system
—how d.c. and a.c. speeds are regulated
—what brakes should be used for different systems
—how flywheels can be used to greater advantage
—what armature reaction does
—for what work the squirrel-cage motor is fitted
—under what conditions is the Scherbius System of control used
—what are the Multiple and Variable Systems of control
—etc., etc.

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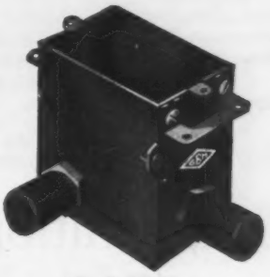

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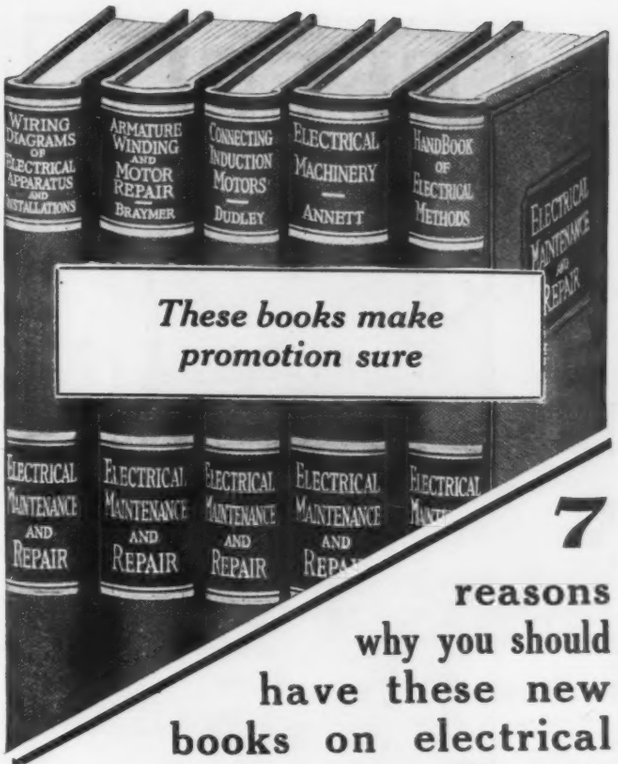
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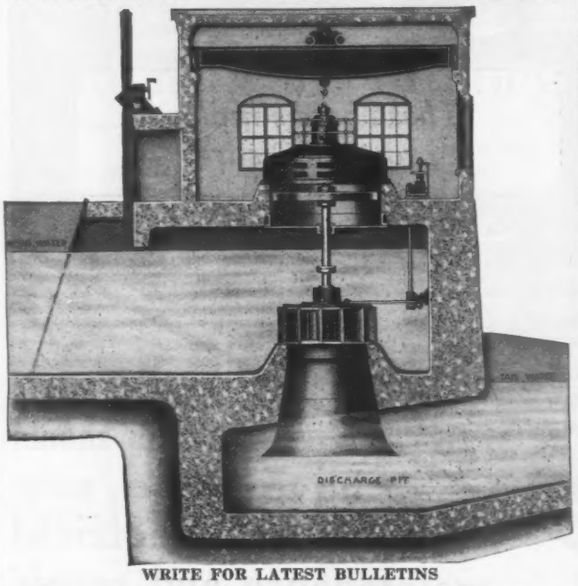

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Works, Franklin, Mass.

BLACK FRICTION TRADE O.K MARK TAPE

WHERE TO BUY

CLASSIFIED INDEX TO ADVERTISERS

Conduit
American Wiremold Co.
Baker-Joslyn Company
Clifton Mfg. Co.
General Electric Company
Geat, G. M.
Johns-Manville, Inc.
National Metal Molding Co.
Pacific States Electric Company
Tubular Woven Fabric Co.
Western Electric Company
Youngstown Sheet & Tube Co., The

Conduit Boxes & Fixture Switches
McGill Mfg. Co.

Conduit Fittings
American Wiremold Co.
Baker-Joslyn Co.
Chicago Fuse Mfg. Co.
General Electric Company
National Metal Molding Co.
Pacific States Electric Company
Reiman Wholesale Elec. Co.
Western Electric Company

Connectors
Maydwell & Hartzell, Inc.
Pacific States Electric Company
Sherman Mfg. Company, H. B.
States Company, The
Westinghouse Electric & Mfg. Co.

Contactors, A.C. and D.C.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Company
Industrial Controller Co.
Westinghouse Electric & Mfg. Co.

Controllers, Motor
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Company
Industrial Controller Co.
Wagner Electric Corporation
Western Electric Company
Westinghouse Electric & Mfg. Co.

Converters
General Electric Company
Wagner Electric Corporation
Westinghouse Electric & Mfg. Co.

Cord
Baker-Joslyn Company
Maydwell & Hartzell, Inc.
Okonite Company, The
Pacific States Electric Company
Rockbestos Products Corp.
Simplex Wire & Cable Co.
Tubular Woven Fabric Co.
Western Electric Company

Cranes & Shovels, Crawler
Link-Belt Meese & Gottfried Co.

Cut-outs
Chicago Fuse Mfg. Company
D & W Fuse Works of G. E. Co.
Harvey Hubbell, Inc.
Johns-Pratt Company, The
Pacific States Electric Company
Ward Leonard Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Dimmers, Theater
Cutler-Hammer Mfg. Co.
General Electric Company
Ward Leonard Electric Company

Dynamos
Allis-Chalmers Mfg. Company
General Electric Company
Wagner Electric Company
Westinghouse Electric & Mfg. Co.

Elevating & Conveying Machinery
Link-Belt Meese & Gottfried Co.

Engineers, Construction
Robinson & Co., Inc., Dwight P.
Stone & Webster, Inc.

Engines, Gas and Steam
Allis-Chalmers Mfg. Company
Moore & Company, Chas. C.
Westinghouse Electric & Mfg. Co.

Fans, Portable, Ceiling
Emerson Electric Mfg. Co.
General Electric Company
Pacific States Electric Company
Robbins & Myers Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Fans, Exhaust
Allis-Chalmers Mfg. Company
General Electric Company
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Fault Finders, Electric
Electric Controller & Mfg. Co.
Westinghouse Electric & Mfg. Co.

Fibre
Clapp & LaMoree
Johns-Manville, Inc.
Pacific States Electric Company
Westinghouse Electric & Mfg. Co.

Fireplaces, Logs
Strait & Richards, Inc.

Fixtures, Fixture Parts
Benjamin Electric Mfg. Co.
Curtis Lighting, Inc.
Duplex Lighting Works
Harvey Hubbell, Inc.
National Metal Molding Co.
Pacific States Electric Company
Pass & Seymour
Sherman Mfg. Company, H. B.
Western Electric Company

Flash Lights, Electric
Pacific States Electric Company
Trumbull Electric Mfg. Co.
Western Electric Company

Flood Light Projectors
Curtis Lighting, Inc.
General Electric Company
Westinghouse Electric & Mfg. Co.

Furnaces, Electric
Hagan Co., Geo. J.

Fuses and Fuse Specialties
Baker-Joslyn Company
Chicago Fuse Mfg. Co.
D & W Fuse Works of G. E. Co.
Electrical Specialty Co., Inc.
Federal Electric Company
Johns-Pratt Company, The
Line Material Co.
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Gloves, Electrician's Rubber
Aetna Rubber Co.

Governors
Allis-Chalmers Mfg. Company
General Electric Company
Pelton Water Wheel Co.

Guards, Lamp
Benjamin Electric Mfg. Co.
Harvey Hubbell, Inc.
McGill Manufacturing Co.
Pacific States Electric Company
Western Electric Company

Hangers, Lamp, Fixture, Cable
Baker-Joslyn Company
Hubbard & Company
Pacific States Electric Company
Standard Underground Cable Co.
The Ohio Brass Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Headlights, Electric
General Electric Company
Westinghouse Electric & Mfg. Co.

Heaters, Air
Hicks, W. Wesley
Strait & Richards, Inc.

Heating Elements
Hagan Co., Geo. J.
Wiegand Co., Edwin L.

Heating Equipment, Electric
Hagan Co., Geo. J.

Heating Appliances, Domestic
Cutler-Hammer Mfg. Co.
Edison Electric Appliance Co.
General Electric Company
Hicks, W. Wesley
Magee Furnace Co.
Magnavox Company
Majestic Electric Appliance Co.
Pacific States Electric Company
Reiman Wholesale Elec. Co.
Simplex Electric Heating Co.
Strait & Richards, Inc.
Western Electric Company
Westinghouse Electric & Mfg. Co.

For a cross-indexed list of manufacturers and their Western Representatives, published semi-annually, see issue of Oct. 15, 1923 for last edition.

WHERE TO BUY

CLASSIFIED INDEX TO ADVERTISERS

Hoists, Electric
General Electric Company
Link-Belt Meese & Gottfried Co.
Moore & Company, Chas. C.

Hoods, Street
Benjamin Electric Mfg. Co.
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Industrial Signals
Benjamin Electric Mfg. Co.

Instruments, Recording, Testing
Jewell Elec. Instrument Co.
Pacific States Electric Company
Roller-Smith Company
Sangamo Electric Co.
States Company, The
Western Electric Company
Weston Electric Instrument Co.

Insulation, Boiler and Pipe
Johns-Manville, Inc.

Insulations, Moulded
Johns-Manville, Inc.

Insulators
Baker-Joslyn Company
General Electric Company
Hemingray Glass Co.
Jeffery-Dewitt Insulator Co.
Lapp Insulator Co., The
Locke Insulator Corp.
Maydwell & Hartzell, Inc.
Pacific States Electric Company
The Ohio Brass Company
Thomas & Sons Company, The R.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Insulating Material
Baker-Joslyn Company
Clapp & LaMoree
Cutler-Hammer Mfg. Co.
D & W Fuse Works of G. E. Co.
Delta-Star Electric Co.
Electrical Specialty Co., Inc.
General Electric Company
Irvington Varnish & Insulator Co.
Johns-Manville, Inc.
Pacific States Electric Company
Standard Underground Cable Co.
Westinghouse Electric & Mfg. Co.

Lamp Frostings
McKay Company

Lamps, Incandescent
Edison Lamp Works
Handel Co., The
Mazda Service of G. E. Co.
National Lamp Works
Pacific States Electric Company
Reiman Wholesale Elec. Co.
Western Electric Company
Westinghouse Lamp Company

Lamps, Smokers'
Lees Co., K. F.

Lamp Standards
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Lighting Fixtures, Street
King Manufacturing Co.
Line Material Co.

Lighting Outfits
Myers Electric Supply Co.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Line Material, Pole, Railway
Baker-Joslyn Company
Electrical Engineers Equip. Co.
General Electric Company
Hubbard & Company
Line Material Co.
Locke Insulator Corp.
Maydwell & Hartzell, Inc.
Pacific States Electric Company
States Co., The
The Ohio Brass Company
Thomas & Sons Company, The R.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Loading Machinery, Portable
Link-Belt Meese & Gottfried Co.

Locknuts and Bushings
Baker-Joslyn Company
National Metal Molding Co.
Pacific States Electric Company

Locomotive Cranes, Steam, Electric
Link-Belt Meese & Gottfried Co.

Machinery, Mining
Allis-Chalmers Mfg. Co.
General Electric Company
Link-Belt Meese & Gottfried Co.

Magnets, Lifting
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Ohio Electric & Controller Co.

Marine Lighting and Signalling Apparatus
Benjamin Electric Mfg. Co.
General Electric Company
Westinghouse Electric & Mfg. Co.

Meters
Duncan Electric Mfg. Co.
General Electric Company
Jewell Elec. Instrument Co.
Roller-Smith Company
Sangamo Electric Co.
Sewickley Electric Mfg. Co.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Meter Testers
Johns-Pratt Company, The
States Company, The

Molding, Metal, Wood
American Wiremold Co.
National Metal Molding Co.
Pacific States Electric Company
Western Electric Company

Motors, A.C., D.C.
Allis-Chalmers Mfg. Company
Crocker-Wheeler Co.
Electric Controller & Mfg. Co.
Fairbanks, Morse & Co.
General Electric Company
Ohio Electric & Controller Co.
Robbins & Myers Company
Valley Electric Co.
Wagner Electric Corporation
Western Electric Company
Westinghouse Electric & Mfg. Co.

Motor Generators
Crocker-Wheeler Co.
General Electric Company
Wagner Electric Corporation
Western Electric Company
Westinghouse Electric & Mfg. Co.

Motor Starters
Condit Electrical Mfg. Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Company
Industrial Controller Co.
Pacific States Electric Company
Trumbull Electric Mfg. Co.
Wagner Electric Corporation
Ward Leonard Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Oil Burners & Systems
Moore & Company, Chas. C.

Oil Fuse Cut-outs, Aerial and Underground
D & W Fuse Works of G. E. Co.

Outlet Boxes and Covers
Chicago Fuse Mfg. Company
National Metal Molding Co.

Packings, Asbestos
Johns-Manville, Inc.

Paint, Insulating
Baker-Joslyn Company
Pacific States Electric Company
Westinghouse Electric & Mfg. Co.

Panel Boards, Panels
Benjamin Electric Mfg. Co.
Chicago Fuse Mfg. Co.
Cutler-Hammer Mfg. Co.
General Electric Company
Pacific States Electric Company
Ward Leonard Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

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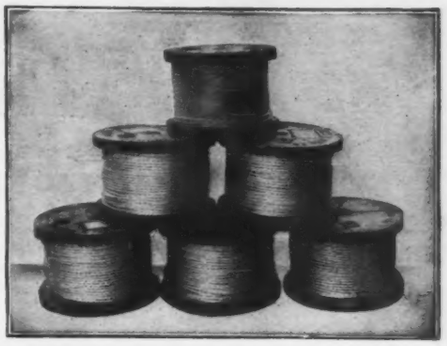
"INDIANA"
Galvanized Steel Strand



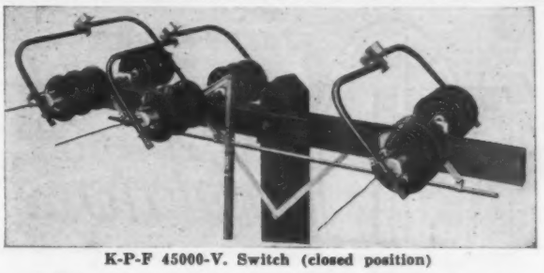
Standard or Commercial Grade, Single and Double Galvanized.

Siemens-Martin, High Strength and Extra High Strength grades, all Double Galvanized. 2-ply and 3-ply Wire for Special Purposes.

"INDIANA"
Double Galvanized Telephone and Telegraph Wire

We make this wire in three grades—E. B. B. B. B. and Steel.

Indiana Steel & Wire Company
Muncie, - - Indiana



K-P-F 45000-V. Switch (closed position)

K-P-F pole top switches minimize installation and maintenance costs.

Each pole is a self-contained unit. Switches are shipped ready to bolt to crossarms. No deadends or extra line hardware required. One crossarm supports it. Send for Bulletin 105.

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855-859 Howard St. San Francisco

Standard Underground Cable Co.
Manufacturers of
Copper, Brass, Bronze Wires; Copper and Brass Rods, Tubes; Copper Clad Steel Wire; Insulated Wires and Cables; Cable Accessories.
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San Francisco, Calif.
Seattle Los Angeles Salt Lake City
Pacific Coast Factory: Emeryville, Cal.

Nichrome

Ask any electrical engineer
—any appliance manufacturer
—any central station man.

They all know Nichrome as the "Business End" of the most highly developed electrical heating appliances.

The important thing for you to know is that Nichrome is also the best "Business End" for popular-priced appliances.

Then make sure that you get Nichrome. Specify Nichrome in your orders. Satisfy yourself that the salesmen, as well as the manufacturer, know that Nichrome is the resistance wire made by the Driver-Harris Co., Harrison, N. J.

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San Francisco Los Angeles
Portland Seattle

The DRIVER-HARRIS WIRE

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Lapp Insulators

Lapp Insulator Co. Inc. Le Roy, N.Y.

Pacific Coast Representative
S. HERBERT LANYON
New Call Bldg. San Francisco

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WIRES CABLES

CALIFORNIA WIRE

It pays to get acquainted with "California Wire"

California Wire Co.
ORANGE, CALIFORNIA
747 Warehouse St.
Los Angeles

WHERE TO BUY

CLASSIFIED INDEX TO ADVERTISERS

Pins, Wood, Iron, Steel
Baker-Joslyn Company
Hubbard & Company
Line Material Company
Locke Insulator Corp.
Maydwell & Hartzell, Inc.
Pacific States Electric Company
Thomas & Sons Company, The R.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Pipe, Pressure
Kellogg Company, The M. W.
National Tube Co.

Plates, Flush Switch
Pacific States Electric Company
Western Electric Company

Pliers, Insulated
Bard-Parker Co., Inc.

Plugs, Receptacles, Sockets
Ajax Electric Specialty Co.
Benjamin Electric Mfg. Co.
Bryant Electric Co.
Connecticut Elec. Mfg. Co.
Curtis Lighting, Inc.
Cutler-Hammer Mfg. Co.
Hart & Hegeman Mfg. Co.
Harvey Hubbell, Inc.
McGill Manufacturing Co.
Pacific States Electric Company
Pass & Seymour
Western Electric Company

Poles, Iron, Steel, Wood
Baker-Joslyn Company
Bates Expanded Steel Truss Co.
Carney & Co., B. J.,
Maydwell & Hartzell, Inc.
Pacific Coast Steel Co.
Pacific States Electric Company
Western Electric Company

Pole Jacks
Templeton, Kenly & Co. Ltd.

Porcelain Specialties
Baker-Joslyn Company
Locke Insulator Corp.
Maydwell & Hartzell, Inc.
Pacific States Electric Company
Thomas & Sons Company, The R.
Western Electric Company

Potheads
G & W Electric Specialty Co.
Standard Underground Cable Co.
Westinghouse Electric & Mfg. Co.

Power Plants
Allis-Chalmers Mfg. Company
General Electric Company
Moore & Company, Chas. C.
Westinghouse Electric & Mfg. Co.

Power Transmission, Mechanical
Link-Belt Meese & Gottfried Co.

Printing
Neal, Stratford & Kerr

Projectors, Electric
Curtis Lighting, Inc.
General Electric Company
Westinghouse Electric & Mfg. Co.

Protective Devices
Condit Electrical Mfg. Co.
Roller-Smith Company

Pumps
Moore & Company, Chas. C.
Pelton Water Wheel Co.
Westinghouse Electric & Mfg. Co.
Worthington Pump & Machy.Corp.

Push Buttons
Benjamin Electric Mfg. Co.
Electric Controller & Mfg. Co.
Harvey Hubbell, Inc.
Pacific States Electric Company
Western Electric Company

Radiators, Electric
Reiman Wholesale Electric Co.
Simplex Electric Heating Co.

Radio Apparatus
Pacific States Electric Company

Rail Bonds
General Electric Company
The Ohio Brass Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Rectifiers
General Electric Company
Pacific States Electric Company
Valley Electric Co.
Wagner Electric Corporation
Western Electric Company
Westinghouse Electric & Mfg. Co.

Reflectors
Benjamin Electric Mfg. Co.
Curtis Lighting, Inc.
Duplex Lighting Works
Harvey Hubbell, Inc.
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Regulators, Voltage
General Electric Company
Ward Leonard Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Reinforcing Bars
Pacific Coast Steel Co.

Relays
Condit Electrical Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Company
Westinghouse Electric & Mfg. Co.

Resistances
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Company
Ward Leonard Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Rheostats
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Company
Pacific States Electric Company
Ward Leonard Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Roofing and Siding
Johns-Manville, Inc.

Rosettes
General Electric Company
Harvey Hubbell, Inc.
Pass & Seymour

Screens, Rock
Link-Belt Meese & Gottfried Co.

Screens, Water Intake
Link-Belt Meese & Gottfried Co.

Searchlights
General Electric Company
Pacific States Electric Company

Silent Chain Drive
Link-Belt Meese & Gottfried Co.

Sockets, Pull
Harvey Hubbell, Inc.

Solder, Self-fluxing, Solid Wire and Bar
Baker-Joslyn Company
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Solenoids
Electric Controller & Mfg. Co.
Westinghouse Electric & Mfg. Co.

Stationery
Neal, Stratford & Kerr

Steel, Structural & Reinforcing
Pacific Coast Steel Co.

Street Lighting
General Electric Company
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Strippers, Wire
Bard-Parker Co., Inc.

For a cross-indexed list of manufacturers and their Western Representatives, published semi-annually, see issue of Oct. 15, 1923 for last edition.

WHERE TO BUY

CLASSIFIED INDEX TO ADVERTISERS

Sub-Stations
Delta-Star Electric Co.
Electrical Engineers Equip. Co.
Railway and Industrial Engr. Co.
Westinghouse Electric & Mfg. Co.

Subway Boxes
Johns-Pratt Company, The

Switchboards
Allis-Chalmers Mfg. Co.
Baker-Joslyn Company
Condit Electrical Mfg. Co.
Elec. Power Equipment Corp.
General Electric Company
Johns-Manville, Inc.
Pacific States Electric Company
Trumbull Electric Mfg. Co.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Switches, Automatic Time
Anderson Mfg. Co., Albert & J. M.

Switches, High Tension
Allis-Chalmers Mfg. Company
Champion Switch Company
Condit Electrical Mfg. Co.
Delta-Star Electric Co.
Electrical Engineers Equip. Co.
Elec. Power Ekuipment Corp.
General Electric Company
K-P-F Electric Co.
Railway and Industrial Engr. Co.
Trumbull-Vanderpoel Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

Switches, House Service
Baker-Joslyn Company
Benjamin Electric Mfg. Co.
Condit Electrical Mfg. Co.
Connecticut Elec. Mfg. Co.
Cutler-Hammer Mfg. Co.
Elec. Power Equipment Corp.
General Electric Company
Harvey Hubbell, Inc.
Pacific States Electric Company
Reiman Wholesale Elec. Co.
Trumbull-Vanderpoel Elec. Mfg. Co.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Switches, Motor Controlling
Condit Electrical Mfg. Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Electric Power Equipment Corp.
General Electric Company
Industrial Controller Co.
Johns-Pratt Company, The
Pacific States Electric Company
Square D Company
Trumbull Electric Mfg. Co.
Trumbull-Vanderpoel Elec. Mfg. Co.
Western Electric Company
Westinghouse Electric & Mfg. Co.

Tape, Friction, Rubber
Appleton Rubber Co.
Baker-Joslyn Co.
Boston Woven Hose & Rubber Co.
Clifton Mfg. Co.
General Electric Company
Johns-Manville, Inc.
New York Insulated Wire Co.
Okonite Company, The
Pacific States Electric Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Telephone Equipment
Pacific States Electric Company
Western Electric Company

Terminals
States Company, The

Time Clocks
Tork Company

Tools, Linemen and Construction
Baker-Joslyn Company
Buhrke Co., R. H.
Hubbard & Company
Leach Company
Maydwell & Hartzell, Inc.
Pacific States Electric Company
Western Electric Company

Towers, Steel
Bates Expanded Steel Truss Co.
Blaw-Knox Company
Pacific Coast Steel Co.

Toys, Electric
Lionel Corp., The

Transformers
Allis-Chalmers Mfg. Company
Duncan Electric Mfg. Co.
General Electric Company
Pacific States Electric Company
Packard Electric Co., The
States Company, The
Wagner Electric Corporation
Western Electric Company
Westinghouse Electric & Mfg. Co.

Traps, Steam
Johns-Manville, Inc.

Trolley Line Material
Baker-Joslyn Company
General Electric Company
Pacific States Electric Company
The Ohio Brass Company
Western Electric Company
Westinghouse Electric & Mfg. Co.

Turbines, Hydraulic, Water Wheels
Allis-Chalmers Mfg. Company
Cramp & Sons Co., The Wm.
Leffel & Co., The James
Pelton Water Wheel Co.
Smith Company, S. Morgan
Worthington Pump & Machy.Corp.

Turbines, Steam
Allis-Chalmers Mfg. Company
General Electric Company
Westinghouse Electric & Mfg. Co.

Underfloor Duct
Johns-Manville, Inc.

Water Heaters
Everhot Mfg. & Electric Co.
Hicks, W. Wesley

Water Wheel Governors
Woodward Governor Co.

Welding Apparatus, Electric
General Electric Company
Pacific States Electric Company
The Ohio Brass Company
Western Electric Company

Windings
Dudlo Manufacturing Co.
Shelton Electric Co.

Wire, Galvanized Steel
American Copper Products Corp.
American Ins. Wire & Cable Co.
Baker-Joslyn Company
Maydwell & Hartzell, Inc.
Pacific States Electric Company
Phillips Wire Co.
Rockbestos Products Corp.
Roebling's Sons Co., John A.
Rome Wire Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Company.

Wire, Bare and Insulated Copper
American Ins. Wire & Cable Co.
Anaconda Copper Mining Co.
Baker-Joslyn Company
California Wire Co.
Collyer Insulated Wire Co.
Dudlo Manufacturing Co.
Indiana Rubber & Insul. Wire Co.
Indiana Steel & Wire Co.
Maydwell & Hartzell, Inc.
National Metal Molding Co.
New York Insulated Wire Co.
Okonite Company, The
Pacific States Electric Company
Peerless Ins. Wire & Cable Co.
Phillips Wire Co.
Reiman Wholesale Elec. Co.
Rockbestos Products Corp.
Roebling's Sons Co.
Rome Wire Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Company

Wire, Electric Resistance
Driver-Harris Company

Wiring Devices
Connecticut Elec. Mfg. Co.
Harvey Hubbell, Inc.
Myers Electric Supply Co.
Pacific States Electric Company

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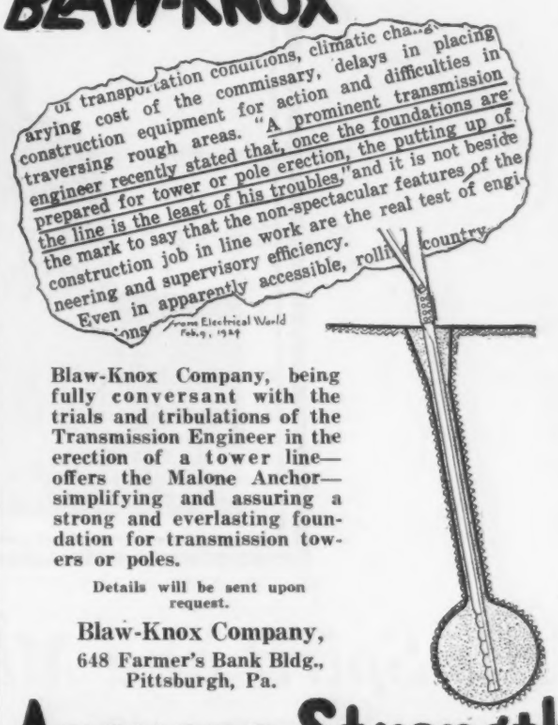
BLAW-KNOX


of transportation conditions, climatic cha
arying cost of the commissary, delays in placing
construction equipment for action and difficulties in
traversing rough areas. "A prominent transmission
engineer recently stated that, once the foundations are
prepared for tower or pole erection, the putting up of
the line is the least of his troubles," and it is not beside
the mark to say that the non-spectacular features of the
construction job in line work are the real test of engi-
neering and supervisory efficiency.
Even in apparently accessible, rollin country
From Electrical World
Feb. 9, 1924

Blaw-Knox Company, being fully conversant with the trials and tribulations of the Transmission Engineer in the erection of a tower line—offers the Malone Anchor—simplifying and assuring a strong and everlasting foundation for transmission towers or poles.

Details will be sent upon request.

Blaw-Knox Company,
648 Farmer's Bank Bldg.,
Pittsburgh, Pa.

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CARBON BRUSHES FOR EVERY MOTOR

To get the maximum power from your motors they should be equipped with brushes that are best adapted to each different type. You will find our representatives know exactly the kind of brush you need.

Call On Them At Any Time

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202 Russ Building, San Francisco, California
Special Service Sales Co., 502 Delta Bldg., Los Angeles
W. R. Hendrey Co., Hoge Bldg., Seattle

BLACK IRVINGTON INSULATION YELLOW

Seamless Bias Tape

"IRV-O-SLOT" "CELLULAK"

VARNISHED CAMBRIC

FLEXIBLE VARNISHED TUBING

VARNISHED SILK VARNISHED PAPER

IRVINGTON VARNISH & INSULATOR CO.
IRVINGTON, N. J.

His Spirit and Mind Live on in Books

The Superman and Wizard of Electrical Science is dead; but the results of his profound vision and persistent enthusiasm are at your disposal in his books and papers which have been well described as the very "cornerstone and foundation of modern electrical practice."

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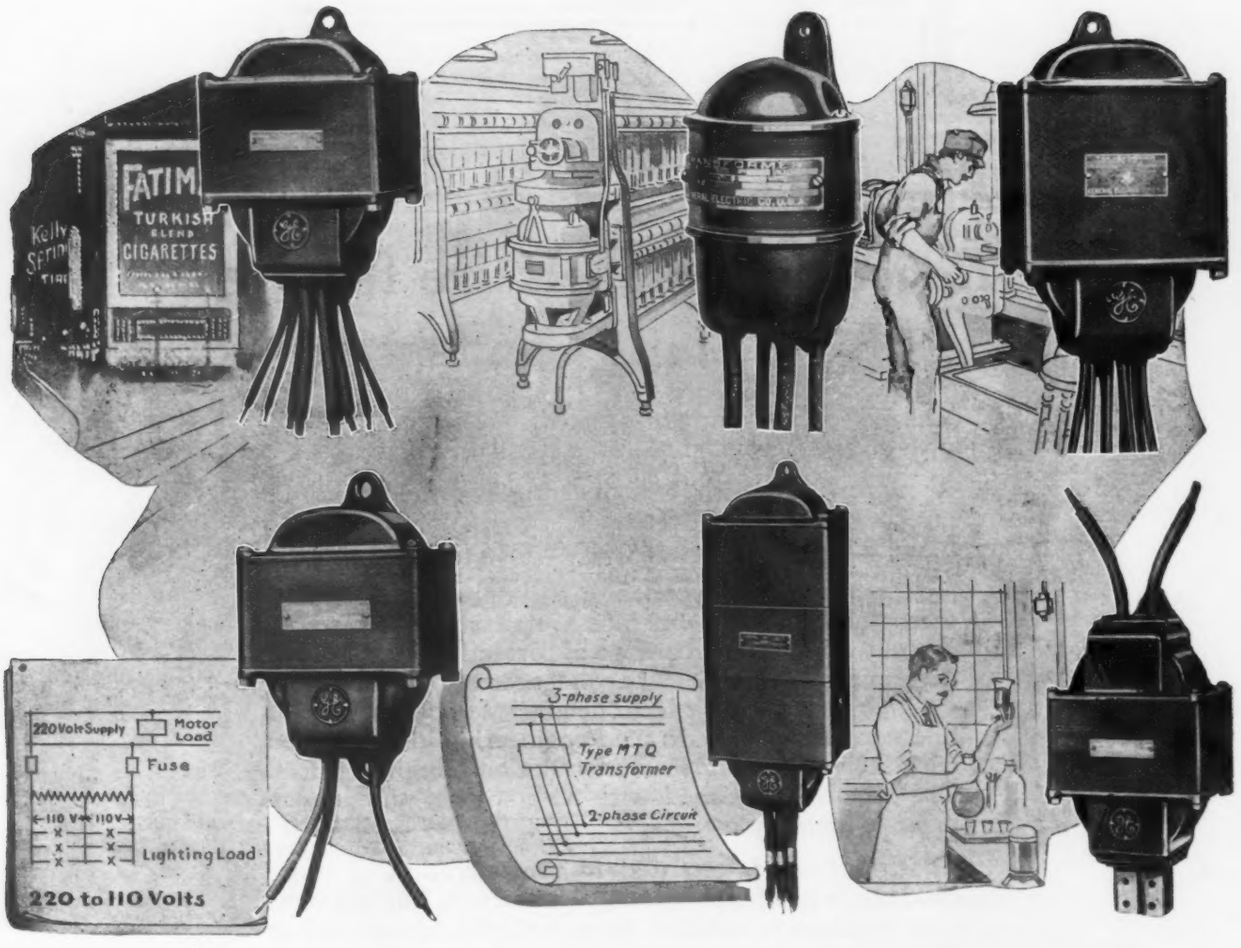

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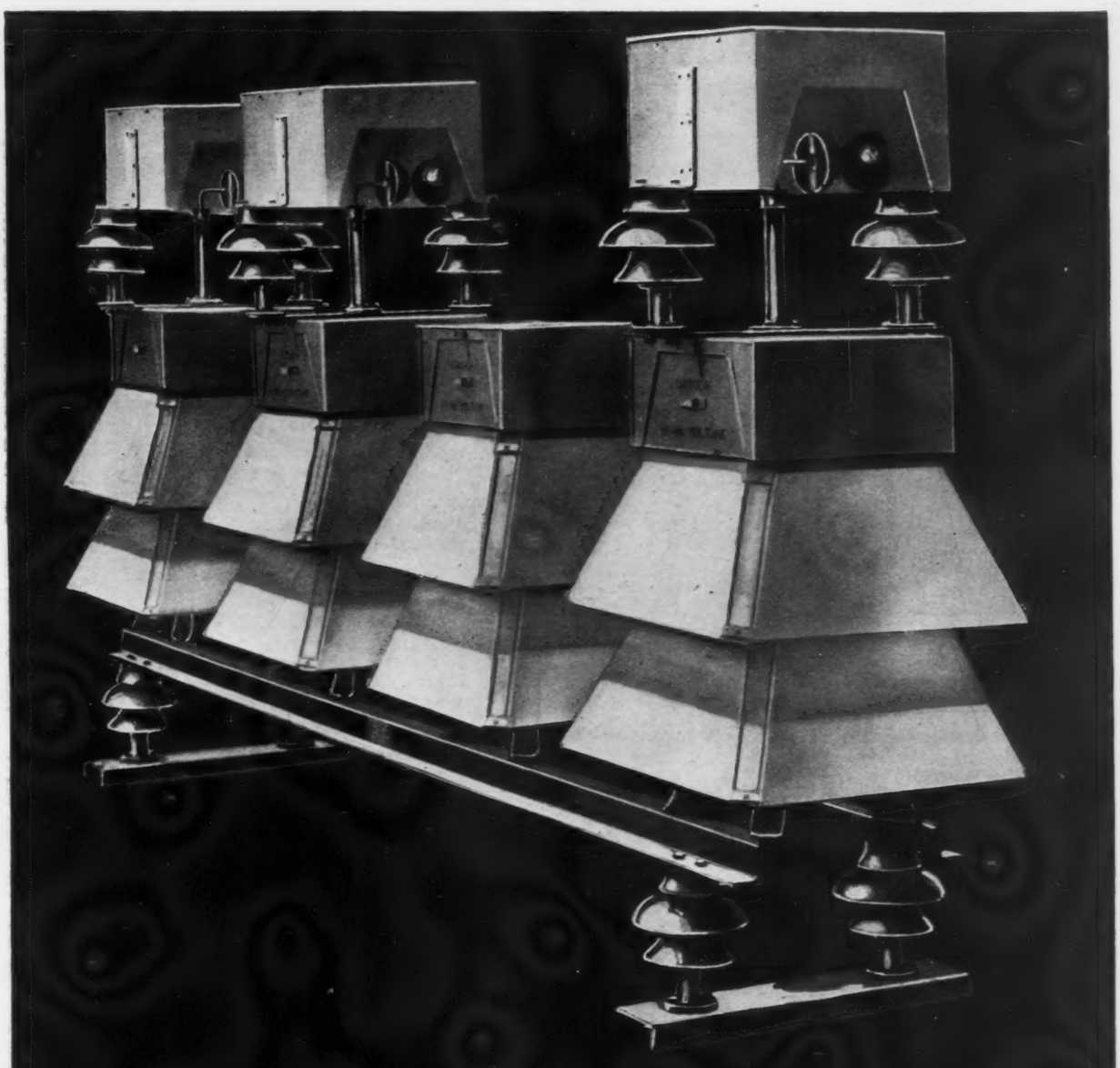

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